SCIENTIFIC AMERICAN

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STONE ENGRAVING.

The art of engraving on precious stones or gems, called *pietrê durê*, says the "Encyclopædia Londoniensis," is one of those wherein the ancients excelled; there being many antique agates, carnelians, and onyxes which greatly surpass anything of the kind produced by the moderns. Prygoteles, among the Greeks, and Dioscorides, under the first emperors of Rome, are the most eminent of these engravers recorded in history. The former was so esteemed by Alexander that he forbade anybody else to engrave his head, and Augustus' head, engraved by the latter, was deemed so beautiful that the succeeding emperors chose it for their seal. The polite arts having been buried under the ruins of the Roman empire, the art of engraving on gems met with the same fate. It was revived in Italy in the beginning of the fifteenth century, when John, of Florence, and after him Dominic, of Milan, performed works of this kind no way to be despised. From their time such sculptures and seals became common in Europe and particularly in Germany, whence great numbers were sent into other countries, but they were far short of the beauty of those of the ancients. The number of engravers of gems has been so great that the collection made by Mr. Taffie, in Leicester Square, London, alone occupies two large quarto volumes in the mere recital.

Our engraving shows a portion of the interior of the stone engraving establishment of Messrs. Shaffer & Hahn, of 66 Nassau street, New York city. The great bulk of stone engraving done in the country is executed here. Anything from an initial letter or crest to the finest relief portrait can be done in this establishment.

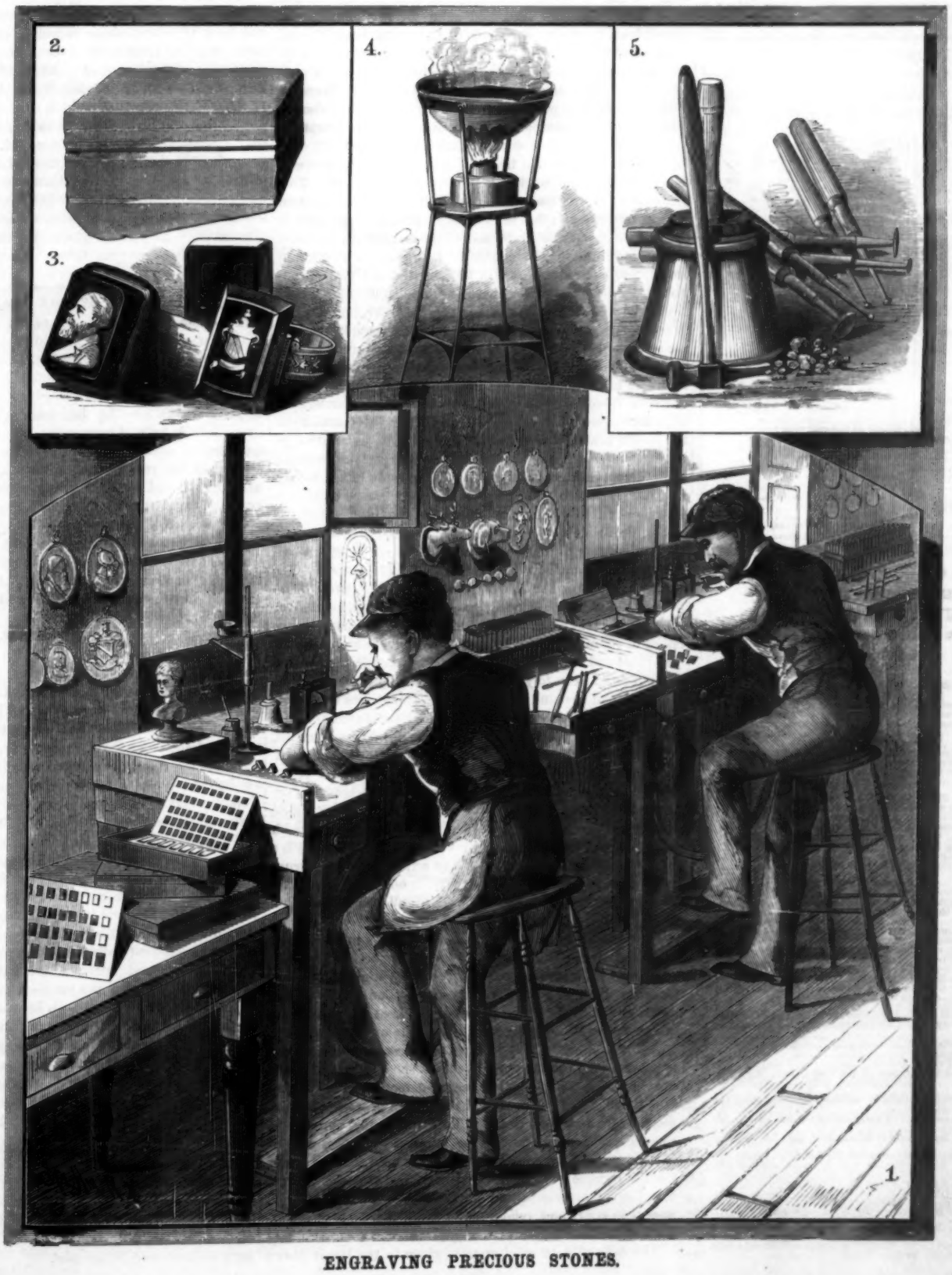
The engraving is not confined to any particular kind of stone, but onyx, by reason of its peculiar adaptability to the purpose, is preferred.

The raw onyx is treated before engraving, to give it color. This treatment, in the case of the black stone, consists in boiling it in molasses for a time, varying from four days with the softer varieties to as many weeks with the harder varieties. The stone is at first of a greenish-gray. After boiling in molasses it is treated with sulphuric acid, which carbonizes the molasses absorbed by the stone. The stone is colored a dark brownish-red by means of oxide of iron. Stones striated with light-colored layers are colored only in the softer and darker parts, the harder parts being incapable of absorbing the coloring matter.

The engraving is done by means of diamond powder applied to the edges of soft iron wheels of different thicknesses and diameter. These wheels are revolved in a suitable lathe driven by foot power.

The stones are cemented to a cork for convenience in handling, and the operator holds them in contact with the wheel, at the same time viewing his work through a magnifying glass. This work requires a true artist, who must be a mechanic as well.

The diamond used on the wheels is crushed and powdered in the steel mortar shown in one of the smaller views (Fig. 5).



ENGRAVING PRECIOUS STONES.

The engraving shows, in addition to the interior of the establishment, the operation of boiling a specimen of the crude stone, and examples of the work.

Washington Monument.

The engineer in charge of the construction of Washington Monument, in Washington, reports that the addition to the height of the structure since the work was renewed, August 7, 1880, is 100 feet. The monument is now 250 feet high above the base. Seventy-four feet were added last year. The balance of appropriation available December 1 was enough to carry the obelisk to the height of 286 feet.

White Slates.

A German, named Schmidt, has patented a school slate which consists essentially of a stiff piece of white cardboard, covered with artificial or paper parchment prepared by the action of sulphuric acid upon unsized paper.

They are set in the ordinary wooden frame, and furnish a cheap and indestructible slate. The ordinary size sells for 30 pfennigs (7½ cents). He also makes a peculiar kind of ink for use with these slates, called "children's ink" (*Kindertinte*). It is made of harmless mineral colors and a solution of dextrine, and has an advantage over common ink, that the blots which children are sure to make can be easily washed out with cold water. The same slate can also be used to write on with ordinary ink or lead pencil, and both washed off with a moistened sponge.

When the slates are intended for use with lead pencils they are coated with water glass, which permits of writing upon the slate immediately after washing and while still wet. If in the course of time the water glass film gets dirty it can be removed with a piece of sandpaper and a new coating applied with a sponge. The tablet itself shows through the parchment and water glass film perfectly mat white, which permits of its being used in any light, and is especially advantageous for drawing because the shading of drawing is black, and that is more natural than to make white shading with white chalk. Colored pencils or crayons can also be used, and is useful in teaching natural history.

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NEW YORK, SATURDAY, JANUARY 7, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 314,
For the Week ending January 7, 1882.

Price 10 cents. For sale by all newsdealers.

NEW LAWS FOR ANALYZING FOOD AND DRUGS.

There is a probability of increased interest during the next few years in methods of testing the genuineness of all articles of food, beverages, and medicines. Several of the States have lately passed laws authorizing official analysis of these articles wherever they are upon sale. Comprehensive laws of this kind have been passed within a year or two in Wisconsin and New York. And several States have lately enacted official inspection of particular articles; for example, Indiana required analysis of all fertilizers in market and of all the oils into which petroleum enters; Maine, of vinegar; Massachusetts, Nevada, and New Jersey, of milk; Ohio, of milk, butter, cheese, and meat, and of fertilizers.

Anything like censorship of ordinary dealings has generally been unpopular in America, and indeed, in recent years, in England. English laws of three or four centuries ago were stringent in punishing adulterations, but these laws were in great part repealed, and for a long time trade was left free, it being supposed that the seller would find his own interest promoted by selling a good article, and that the buyer would be able to judge of what he bought, and reject it if not according to contract. And such laws as have been passed under the pressure of increasing necessity for protecting the public against adulteration, have, until very lately, avoided everything like censorship of trade, being confined to imposing damages or punishment for any fraud committed, provided the buyer could prove it. They gave him no help in advance. The purchaser bought coffee, sugar, or milk, as he found it on sale in the stores. He carried the article home as it was delivered to him. If there he found the milk watered, the sugar sanded, or the coffee composed in large part of burnt beans or something worse, he could complain, but in proving his complaint he was dependent on such evidence as he could himself command; his own testimony or that of his servants, perhaps, who first opened and used the article. In 1860, and again in 1875, Parliament passed laws for England intended to give purchasers the aid of a system of inspection. The leading features of the system are that inspectors and public analysts are appointed in various localities, and an inspector, or the town or city officers, or even an individual purchaser, may visit a suspected dealer, demand to buy a sample of his goods, carry the sample to the public analyst, and obtain an official examination. The report of the analyst that he finds adulteration becomes evidence, perhaps not conclusive, of the dealer's guilt. This principle of giving the general public the benefit of a system of scientific examination of whatever articles mentioned in the law are upon sale in the shops and markets, is just now winning adoption in this country. If the new laws are vigorously enforced attention will be drawn to all simple, trustworthy modes of detecting these commercial frauds.

The New York law was passed May 28, 1881, but was not to go into operation until the fall. To understand its method the reader must recall that in 1880 the legislature created a State Board of Health. There were, previously, local boards of health in particular cities. These are not abolished, but the State Board is clothed with power to work throughout the entire State in collecting and arranging information on the public health and mortality, supervising registration of births, marriages, and deaths, enforcing various sanitary laws, investigating alleged nuisances, and the like. By the new law to prevent adulterations this State Board of Health is authorized to "take cognizance of the interests of the public health as it relates to the sale of food and drugs and the adulteration of the same, and make all necessary investigations and inquiries relating thereto." The board is directed to prepare rules and regulations with regard to the proper methods of collecting and examining articles and for the appointment of inspectors and analysts, and may remove either of those officers who may be deemed incompetent. The rules and regulations are to be published in the book of statutes from year to year. The law includes every article used for food or drink by man, and all medicines for internal or external use, except mixtures or compounds recognized as ordinary articles of food not injurious to health, and distinctly labeled as mixtures, and except specific articles which the Board of Health, with the approval of the Governor, may declare to be exempted from the law. Every dealer is required by the law to serve or supply any public analyst or other agent of the State, or a local board of health who may apply and tender the value of the same, with a sample sufficient for analysis of any article of food or drugs in his possession. A penalty of fifty or one hundred dollars for a first or any subsequent refusal to sell a sample is imposed.

The scheme of the law is that these samples may be examined by the public analyst and his report may be used as a basis of bringing the dealer under punishment, and there is a distinct provision imposing a fine of fifty or one hundred dollars for a first or any subsequent offense of manufacturing or keeping for sale any article of food or drugs which is adulterated. It will not be necessary under the law to prove a sale, for knowingly keeping the adulterated goods in stock is enough. The law seems defective in not saying how the report of the analyst shall be used to secure the conviction of a dishonest dealer. This want may perhaps be supplied by a regulation to be adopted by the Board of Health, though the courts may probably hold that the dealer has the right to be "confronted with the witnesses against him;" in other words, that the analyst must, if required, appear in court and relate, under oath, the facts of the examination made by him.

The definition of adulteration given in the law is drawn with more care than are other portions; it well deserves scrutiny of experts in this field. It is as follows:

An article shall be deemed to be adulterated within the meaning of this act.

A.—In the case of drugs

1. If, when sold under or by a name recognized in the United States Pharmacopœia, it differs from the standard of strength, quality, or purity laid down in such work.

2. If, when sold under or by a name not recognized in the United States Pharmacopœia, but which is found in some other pharmacopœia or other standard work on materia medica, it differs materially from the standard of strength, quality, or purity laid down in such work.

3. If its strength or purity fall below the professed standard under which it is sold.

B.—In the case of food or drink.

1. If any substance or substances has or have been mixed with it so as to reduce or lower or injuriously affect its quality or strength.

2. If any inferior or cheaper substance or substances have been substituted wholly or in part for the article.

3. If any valuable constituent of the article has been wholly or in part abstracted.

4. If it be an imitation of or be sold under the name of another article.

5. If it consists wholly or in part of a diseased or decomposed, or putrid or rotten, animal or vegetable substance, whether manufactured or not, or in the case of milk, if it is the produce of a diseased animal.

6. If it be colored, or coated, or polished, or powdered, whereby damage is concealed, or it is made to appear better than it really is, or of greater value.

ENGLISH AS THE SPEECH OF THE FUTURE.

The success of the English-speaking peoples as colonists and their superior prolificness are not the only reasons for thinking that the English tongue is destined to dominate the world. The flexibility and terseness of the English language has made it the language of international telegraphy, and from statistics just collected it appears to be the great newspaper language. In other words, it about equally divides the newspapers of the world with all other tongues combined.

The total number of newspapers and periodicals now published is given in H. P. Hubbard's forthcoming "Newspaper and Bank Directory of the World," as 34,274, with a circulation of about 116,000,000 copies, the annual aggregate circulation reaching, in round numbers, 10,600,000,000 copies. Europe leads with 19,557, and North America follows with 12,400, the two together making over nine-tenths of all the publications in existence. Asia has 775; South America, 699; Australasia, 661; and Africa, 132. Of all these, 16,500 are printed in the English language, 7,800 in German, 3,850 in French, and over 1,600 in Spanish. There are 4,020 daily newspapers, 18,274 tri-weeklies and weeklies, and 8,508 issued less frequently. It appears that while the annual aggregate circulation of publications in the United States is 2,000,000,000, that of Great Britain and Ireland is 2,260,000,000.

THE LOSS OF THE JEANNETTE.

In the loss of the Jeannette another vessel has been added to the list of sacrifices to Arctic exploration. Fortunately the commander of the expedition, Lieutenant De Long, and nearly all of the other officers and crew, have been saved, and strong hopes are entertained with regard to the safety of the rest. Before the Jeannette sailed from San Francisco, July 8, 1879, Commander De Long announced his intention to retreat upon the Siberian settlements in case of disaster to his vessel. The disaster came, and the retreat has been effected with as great success as could have been expected under the circumstances.

On the 19th of December, 1881, the Governor of Eastern Siberia telegraphed that three months before two boat loads from the wrecked Jeannette had reached a remote part of the Siberian coast, near the mouth of the Lena; and the announcement was quickly followed by a dispatch from Engineer Melville, as follows:

"IRKUTSK, Dec. 21, 2:05 P.M.

"Jeannette was crushed by the ice in latitude 77 deg. 15 min. north, longitude 157 deg. east. Boats and sleds made a good retreat to fifty miles northwest of the Lena River, where the three boats were separated in a gale. The whaleboat, in charge of Chief Engineer Melville, entered the east mouth of the Lena River on September 17. It was stopped by ice in the river. We found a native village, and as soon as the river closed I put myself in communication with the Commandant at Boloemga. On October 29 I heard that the first cutter, containing Lieutenant De Long, Dr. Ambler, and twelve others, had landed at the north mouth of the Lena. The Commandant at Boloemga sent instant relief to the whaleboat party, who are well. Nindeman and Noras arrived at Boloemga on October 29 for relief for the first cutter, all of whom are in a sad condition and in danger of starvation, and all badly frozen. The Commandant at Boloemga has sent native scouts to look for them, and will urge vigorous and constant search until they are found. The second cutter has not yet been heard from."

The Jeannette was last seen September 3, 1879, steaming northward toward what is now known as Wrangell Island. The course since then is unknown, save that it must have been westward for about a thousand miles. The place of the disaster was about five hundred geographical miles northeast of the mouths of the Lena, the nearest known land, the New Siberian Islands, being about a hundred and fifty miles away.

THE Arizona, of the Guion Line, during the past summer, made five trips between New York and Liverpool, *via* Queenstown, averaging 7 days 12 hours and 4 minutes for each trip between New York and Queenstown. The Elbe, of the Bremen Line, has made the passage westwards in 7 days 10 hours and 25 minutes.

The Recent Boiler Explosion at the Dayton Wheel Works.

To the Editor of the Scientific American:

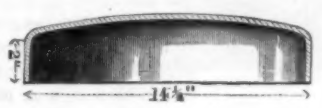
We have carefully read the article in your issue of SCIENTIFIC AMERICAN, December 17, 1881, on the "Boiler Explosion at Dayton Wheel Works," October 25th last.

You are right: boiler explosions *should not* be put down to mysterious causes, such as "*Electricity*," etc., and with the hope that we may still get to the *reason why* good iron becomes *brittle*, we venture to ask a few questions:

Would good iron (say C.H. No. 1, 55,000 T. S.) become brittle if thickly incrusted on the inside with hard lime scale such as steam users have to contend with in this Miami Valley (the water from wells passing through a limestone bed), and would not such incrustation particularly affect the longitudinal seams on the sides exposed to fire?

And would not the hinge-bending motion referred to as caused by variations of pressure on the flattened portion of the boiler at the double-riveted seam be intensified somewhat by the quick motion cut-off of an engine (no disparagement to engine meant), which *did cause* a variation of pressure of three pounds of steam, as indicated by steam gauges at every stroke of the piston?

Now, Mr. Editor, we have in our office a boiler head of flanged iron, cut from a point as near as possible to the supposed initial fracture on boiler shell—dimensions, 14¼ inches diameter; flange turned on same 2 inches deep, as shown by sketch—*and there is not a flaw or crack in it anywhere.* This head was turned by hand in the presence of the committee. They also bent portions of this iron cold in different ways, and pronounced the material to be good.



We are as anxious as any one else to demonstrate that steam boilers explode from a cause or causes, and trust that this article may be the means of calling forth the experience of others.

E. H. BROWNELL & CO.,
Per JOHN T. CAULFIELD, Supt.

Dayton, O., December, 1881.

Remarks.—Nothing has so far appeared from the investigations of the disaster that reflects adversely upon the workmanship or good faith of Messrs. Brownell, the makers of the boiler in question. Their reputation for thoroughly good work and good materials is widely known. But in the present state of the art of iron plate manufacturing there is risk that both the seller and the purchaser may be deceived, since carelessness on the part of puddlers, or the presence of a lump of deleterious matter in the ball, may produce a bad spot in the rolled plate, which does not show to the eye, and which might readily escape the notice of the boiler maker.

There is need for a simple and easy means of detecting the presence of bad places or poverty in the quality of finished boiler plates; and the inventor who succeeds in studying it out will deserve well of the public.

Steel plates, owing to their greater general strength and the greater purification of the material in the process of manufacture, are safer and therefore better adapted for boilers than iron plates.

To the question, "Would good iron (say C. H. No. 1. 55,000 T. S.), become brittle if thickly incrusted on the inside with hard lime scale, such as steam users have to contend with in the Miami Valley (the water from wells passing through limestone beds)?" the answer is, Yes.

"And would not such incrustation particularly affect the longitudinal seams on the sides exposed to the fire?" Answer, Yes. Lime scale has no chemical effect on the iron tending to change its internal structure as some people appear to think. It is rather than otherwise a protector against corrosion of the surfaces which it covers, and in a boiler above the fire line is harmless; but if it adheres to the inside of parts that are, on the outside, exposed to the direct action of the fire, the transmission of the heat to the water is obstructed and the metal is damaged by being overheated and cooled repeatedly. Larger deposits of scale are likely to take place at the longitudinal seams on account of the presence of rivet heads and the edge of the lap; particularly when the inner edge is upward, forming a ledge for the lodgment of the precipitated solids. Longitudinal seams are the weakest line of a cylindrical shell, and should never be exposed to the fire.

"And would not the hinge-bending motion referred to as caused by variations of pressure on the flattened portion of the boiler at the double riveted seam be intensified somewhat by the quick motion cut-off of an engine . . . which *did cause* a variation of three pounds of steam, as indicated by the steam gauge at every stroke of the piston?"

Answer, Yes. Sixty-nine revolutions means one hundred and thirty-eight pulsations per minute.

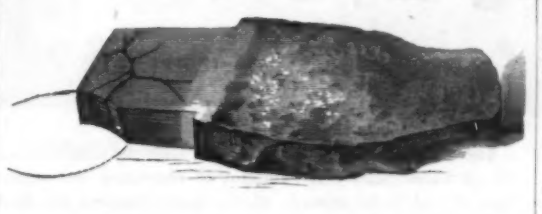
The regular strain on the iron of a sixty-inch cylindrical shell at ninety pounds pressure is $90 \times 30 = 2{,}700$ pounds per lineal inch of longitudinal section of the unpunched plates, 30 being the radius of the boiler in inches.

Now, provided the momentum of the gauge pointer did not show an exaggerated indication of actual variations (it is probable that it did exaggerate), then we have $\frac{3}{2700}$, or more than one pound for every thousand pounds of the maximum load alternately added to and taken from it more than eighty-two thousand times in ten hours. But these impulses are not cumulative or similar to those of a dog trotting upon a long bridge span, as some persons suppose.

The boiler now under consideration, if it had been sound and good, would have had an ample margin of strength for all such pulsations and shocks as are incidents in the use of every steam boiler.

As bearing on this question, we ought to consider the great number of similarly situated boilers, not only in the Miami Valley, but in other places where cut-off engine and bad water are used. Hundreds of such boilers have endured for many years the same things to which this one succumbed in less than one year. It was new in December, 1880, and exploded in October, 1881. The variations of pressure from which distorted shells, or those that are otherwise weak, suffer most, are the extremes which occur daily in most land boilers, from zero to the maximum pressure. These are less frequent, but give greater motion at the weak line. Such are the variations meant in the SCIENTIFIC AMERICAN's report of the explosion.

The assumption that the iron was originally good where it gave way appears not to be sustained by the condition presented by the iron itself. A chemical test, so simple that any mechanic may apply it, has been used by us upon a sample of the iron from the broken plate, and it reveals serious defects that were not visible to the eye prior to the test.



This sketch is a faithful representation of a fragment of five-sixteenths inch boiler plate from the exploded boiler at Dayton, which was broken from the edge of a longitudinal line of rupture, near a seam on the right-hand side of the boiler. It was twisted off with a wrench after having been nearly detached at the time of the explosion, and prepared for experiment by filing the portion bounded by the straight lines, both on the two surfaces and on the edges. When thus prepared there were no indications to the eye of either crack or lamination. The piece of iron was then suspended in a bath of dilute hydrochloric acid and bichloride of platinum, to the depth shown by the lines on the front edge, for about twelve hours, and when cleaned off with a stiff brush and cold water it presented the appearance shown by the engraving, revealing bad cracks in the iron and poor material.

The dotted circle indicates the locality of one of the rivet holes of a double riveted longitudinal seam on the right-hand side of the boiler at the end of the third top plate from the rear end, the corresponding seam on the adjoining second top plate from the rear end being the line of weakness and of initial rupture. The acid first attacked and more rapidly dissolved the porous portions of the plate that had been damaged by strains when the punching was done, and also the porous lines between solid iron of the laminæ.

The acid bath above referred to consists of dilute hydrochloric acid, one part of strong acid to four of water, to which add, of bichloride of platinum, about two drops to the ounce of the dilute acid, and let the iron remain therein from twenty-four to thirty-six hours. The parts that have been damaged by working, should there be such damage, will be first acted on and the defects will be brought to view.

In respect to the small flanged boiler head sketched by our correspondent, it was examined by the representative of the SCIENTIFIC AMERICAN before the publication of our verdict on this explosion, who was satisfied on seeing it that the iron was "*cold short*," because the flanging was done while the iron was hot; and as to the cold bending of strips by the committee, it is a fact that the iron broke before it was bent to half a right-angle on a curve of fair radius.

Notwithstanding the assurance of our correspondents that there is not a flaw or crack anywhere to be seen in the flanged specimen, and which was personally examined by the committee and pronounced good, still the SCIENTIFIC AMERICAN is of opinion that there is a mistake somewhere, and that by thoroughly submitting the specimen to the acid bath above described, cracks and poverty of the iron will be proven to exist.

A New Dental Disease.

A child, aged ten, whose teeth six months ago appeared to be all perfectly sound, came to me with toothache in the right lower canine. I found that a large portion of the enamel had disappeared from the front surface of the tooth, as if it had been chipped violently off; the dentine was all exposed, but there was no softening or appearance of decay. The disease, which has commenced in several of the other incisor teeth, appears first as a small white spot in about the thickest part of the front surface of the enamel, which it seems to penetrate; and then, suddenly disintegrating, this comes away, and exposes the remaining sensitive enamel and the dentine. This disease is altogether a different thing from the gradual decay, or wear at the neck of the teeth, frequently met with in adults, for in this case the patient is only ten; and, as far as I have been able to ascertain, the incisors and canines never have been known to decay in the manner above described. We are often at our wits' end to cope with the increasing prevalence of caries in the teeth of the very young; and if this be (as I fear it is) a new form of destructive energy, the sooner it is recognized the better.—*N. Stevenson, British Medical Journal.*

Increasing Safety of Steamboat Travel.

The annual report of Gen. Dumont, Supervising Inspector-General of Steam Vessels, shows an encouraging decrease of 29 per cent in the number of lives lost during the past five years compared with the preceding five, notwithstanding an increase of 59 per cent in the number of passengers carried. The figures for the several years are as follows:

Year.	Number Lives Lost.	Passengers Carried.	Steamers Inspected.
1872	306	123,000,000	3,444
1873	301	121,835,085	3,743
1874	195	120,000,000	2,879
1875	607	114,000,000	4,006
1876	393	118,980,000	3,947
Total	1,802	597,115,085	19,819
1877	211	122,000,000	4,149
1878	219	131,420,000	4,351
1879	177	223,880,537	4,416
1880	185	225,000,000	4,536
1881	268	280,000,000	4,779
Total	1,063	982,500,537	22,132

General Dumont recommends a large reduction in the tax upon licensed officers of steam vessels. He would have the inspector's fee for granting certificates reduced to 50 cents. It now averages $7.50.

Ancient Stone Remains on Summit of Rocky Mountains.

At a recent meeting of the Kansas Academy of Science, a paper by J. R. Mead, of Wichita, was read as follows:

During the past summer I had occasion to travel over and along the continental divide which separates the waters of the two oceans, as well as the counties of Gunnison and Chaffee, Colorado, and at a point about four miles west from the town of Monarch, near the head of the South Arkansas, I noticed the *débris* of very ancient works of stone, which, considering their location, were very curious and interesting. They comprised a series of low stone walls, and extending along the smooth summit or backbone of the mountain and connecting two elevated rocky points, about a quarter of a mile apart. On the top of these points were circular inclosures of stone, ten or fifteen feet in diameter, and two feet in height; the walls were made by placing upon edge and leaning together slabs of granite rock, and were originally about two feet or more high, and are so ancient that in many places the granite rock of which they were composed had disintegrated and crumbled into sand. The course of these walls was generally north and south, with frequent dips, spurs, and angles, side walls, and pens, forming an intricate system. The design of it was difficult to comprehend. These marks extended across a convenient top in the mountains, at an altitude of about 11,000 feet, and above timber line. They could hardly have been intended for defense, as the mountain range could be crossed as easily for several miles south as at this point, and I could not see that they would be of advantage in the capture of game. I have heard of such walls on the summit of the mountains further north, from several parties; these are the only ones which I observed in my travels. Their origin and purpose may ever remain a mystery. I have implements of stone picked up in that locality.

Life Preservers in Factories.

The compulsory provision of life preservers on steamers, and their manifest utility, suggest to a correspondent the propriety of a law compelling factory owners to provide at each window a cheap and efficient fire escape, in addition to the appliances and stairways now required. One that would always be ready, easily understood, and usable by any person of ordinary intelligence, even under excitement, could be made in the following manner:

To a staple firmly driven in the wall immediately over each window attach a rope or cord, say three-eighths of an inch in size, and long enough to reach nearly or quite to the ground. This cord should be well made and pliable, and might be knotted at intervals of about fifteen inches. The cord should then be rolled into a coil or ball, and tied in place by a small cord or strap, ready at a moment's notice to be untied and the end thrown out of the window. Men, and even women, could descend it with little difficulty, or the stronger and cooler-headed could tie the rope about the bodies of the weaker and quickly lower them to the helpers below.

THE limiting depth to which light penetrates in water was some time ago stated to be 40 meters for Lake Leman, by Prof. Forel, who used albumenized paper in his experiments. M. Asper has recently made similar experiments on the Lake of Zurich by a slightly different method. He used the photographic plates called *emulsion plates* (more sensitive than albumenized paper), and immersed them during the night of August 3, to depths of 40, 50, 60, 70, 80, and 90 meters. They were brought up after remaining twenty four hours in the water, and treated with oxalate of iron. All the plates, without exception, were distinctly affected by the light. Thus the chemical rays penetrate in clear water to at least 90 meters deep.

IMPROVED CAR COUPLING.

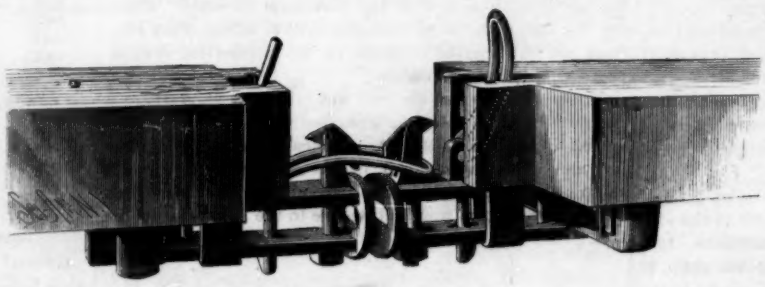
The annexed engraving shows a very simple and effective car coupling, which is capable of being readily adapted to cars now in use, and may be used in connection with other forms of coupling. It is, in fact, an improvement upon the old-fashioned link and pin coupling, which thus far has taken the preference over couplings of more recent design. The improvement illustrated is applied to the ordinary drawheads, and is perfectly automatic in its action. It is needless to refer to the advantages of an automatic coupler; the weekly record of the crippling and maiming of trainmen being a sufficient argument in favor of improvements in this direction. The coupling shown in the engraving consists of a link jointed to a link-pin, the latter being inserted in holes made in the drawhead back of the usual holes for the link pin.

Holding pins with enlarged and strengthened heads are inserted in place of the usual link pin. These pins are provided with latches in their heads, which engage the links when the latter drop down into engagement with the pins.

At the end of each car a block attached to the sill is notched to receive the link when not in use, and the link is retained in the notch by a latch. When the cars are to be coupled the latch retaining one of the links is disengaged, and when the drawheads come together the link is tilted by the spring of the drawhead and falls down over the upper end of the pins of the adjacent couplings as shown in the engraving. The link is disengaged by hand, the latch in the top of the pin being first turned. Both links may be used simultaneously if desired.

It will be seen that this coupling is as simple as the ordinary link coupling, while it is automatic in its operation and reliable.

It is the invention of Mr. Geo. W. Vunk, of Brockport, N. Y. All communications in regard to it should be addressed to Mr. B. E. Huntley, of the same place.



VUNK'S CAR COUPLING.

IMPROVED FILTER.

We give an engraving of a new filter made by the Newark Filtering Company, of 177 Commerce street, Newark, N. J. In this filter the greatest possible filtering surface is provided, and it is capable of filtering the water supply of the largest cities, and is adapted to the use of paper mills, dye works, laundries, steam boilers, etc.

One of the novel features of this filter is the device by means of which the filter beds may be quickly and perfectly cleansed. This device consists of traveling jets of water which may be directed upon every portion of each filter bed.

This filter is constructed mainly of cast iron, and consists of a number of cylindrical compartments varying in depth from twelve to twenty-four inches, according to the quality of the water to be filtered and the degree of filtration required. The several compartments are fastened together by bolts, *f*, forming one apparatus. This affords a very large filtering area in a comparatively small space. The bottom of each compartment is provided with raised studs, upon which finely perforated sheet brass is placed which supports the filtering material.

Water is supplied through the valve, A, to the main vertical inlet port, C, connected with which are the inlet ports, *d*, supplying the water to be filtered to the upper surfaces of the beds of sand or other filtering material. The hand-hole plates, *h*, afford access to all parts. Leading from the space between the perforated brass and the studded bottoms are outlet-ports, *g*, which connect with the main vertical outlet port, D, delivering the filtered water through the valve, G.

In the center of the filter is the pipe, J, which is supplied with water from a pump or other source at a pressure of at least twenty pounds per square inch, in order to afford a sufficient force to the jets. This pipe passes through each compartment, terminating in a socket in the lower compartment. To this pipe, which serves as a shaft, are attached smaller radial pipes, *b*, perforated on their under sides at short intervals, one of the smaller pipes being provided for each bed. The inlet valve, A, and outlet valve, G, are closed, the waste valve, B, and washer valve, J', are opened, and by slowly turning the central pipe shaft, J, by means of the ratchet, L, the smaller pipes, *b*, are revolved, and cause the jets of water to disturb the entire depth of all the filter beds. The effect of this is to detach all the impurities, which being of inferior specific gravity, rise and are carried out of the filter through the ports, *d*, and waste outlet, E. Above the radial pipes, *b*, are semicircular ribbed plates, *i*, which prevent the sand from escaping with the waste water.

While the washing is taking place the process of filtering is not interrupted for a moment, except where a single filter is used, in which case the interruption lasts from three to four minutes. The consumption of water for this purpose need not exceed one per cent of the amount filtered.

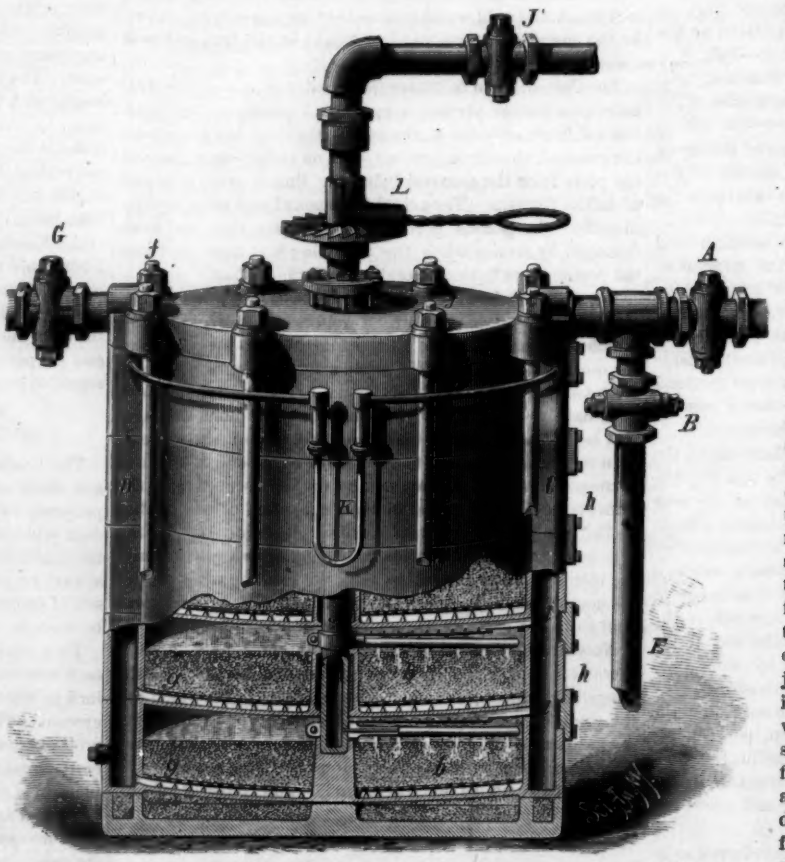
All other filters are cleansed either by reversing the current of water or by removing the filtering material. The first-mentioned process only partially accomplishes the object, and the other involves so great an amount of labor and expense (besides its impracticability) as to preclude its general adoption. The facility with which this filter can be cleansed insures a perfect filtration, and prevents any pollution of the filter bed by the presence of decayed animal and vegetable matter.

The mercury gauge, K, connected with the inlet and outlet, indicates exactly the amount of resistance per square inch offered to the passage of the water through the filter beds, which resistance increases in proportion to the accumulation of silt and to the volume of water passed through. When the beds are clean they will offer a resistance of about one pound per square inch, and when the gauge indicates about four pounds the filter beds should be washed.

In this filter the sand is kept clean and always in a condition for effective work, and the large area required by the old method of filtration through beds of sand is reduced to a minimum, and the area is further diminished by placing the beds one above the other, from three to ten sections high. This enables the manufacturer to place the filter in a mill or building where it will not take up a floor space of more than one three-hundredths part of the area required by the old style of sand bed.

The interior pipes are of brass, and the iron parts are protected against corrosion. It will withstand a high pressure, so that water may be forced through it for reservoirs, boilers, etc., or it may be used under a low head. For high pressures the case is made of wrought iron.

The filter in its original form was the invention of Mr. P. Clark, of Rahway, N. J. It has been brought to its present state of perfection by Mr. John W. Hyatt, a prominent inventor of Newark, N. J.



THE MULTIFOLD FILTER.

RECENT INVENTIONS.

An improvement in washing machines has been patented by Mr. Flavius L. Wickham, of Racine, Wis. This invention relates to washing machines using corrugated rollers, which are moved back and forth over the clothes, and the improvement consists principally in constructing said roller with long and short ribs, whereby, when the roller is moved back and forth, it will pound the clothes, and at the same time exert a rubbing action upon them between the several corrugations of the roller and of the tub in which the roller works. Said roller is journaled in side bars which are in pivoted connection with crosspieces that carry the main handle, and which side bars are united at their top by a hinged handle to facilitate the taking of the roller out of the frame when required. The cover of the tub is sufficiently narrow to pass between the side bars of the roller frame, which consequently is guided by the cover in a straight line when reciprocated, and the roller is free to adjust itself to the unevenness of the clothes in the tub.

An improved air-cooling apparatus, which has been patented by Mr. Alfred C. Garratt, of Boston, Mass., provides in a very simple manner either for directly cooling the person or for cooling apartments. It consists of a vessel filled with one or more ice-holding racks, and having an opening in its top for the admission of air, and a series of discharge apertures below the ice having collars secured in them, over which caps may be placed or pipes for distributing the cooled air be fitted. A fan blower is or may be arranged on the vessel for producing a forced current of air through it, which blower may be operated by hand and the whole device be made portable.

A very convenient and useful wagon stake has been patented by Mr. Eugene F. Chapman, of Scribner, Neb. In this improvement the stake proper is formed with a shoe at its bottom for fitting it upon the end of the bolster to which it may be bolted under the wagon box. The upright portion of said stake is chambered out to receive within it a vertically sliding extension, which has a hook on its upper end that fits over the edge of the box when the extension is wholly inclosed in the stake. The back of this extension is formed with a series of holes, as is also the back of the stake, for supporting the extension, by a rod or brace and pins fitting said holes, in various positions, as, for instance, in a position for supporting a hay or straw rack, or in a position for holding sideboards upon the box, or again in a still different position for supporting a temporary cover over the box or wagon, the bolsters of which are fitted with similar stakes on opposite sides of the wagon.

Mr. James England, of New York city, has patented an ingenious improvement in crozing tools for cutting grooves in the ends of the staves of a barrel to receive the ends of a barrel head. In this improved croze a hollow elliptical tool holder is used. This holder is formed with open ends and with a series of outer longitudinal guide ribs, each of which has a different radius to adjust the holder to the inner surfaces of staves of barrels of different diameters. It also has an inner annular rib near one end of it. The continuity of the outer ribs is interrupted by a like number of longitudinal apertures in the center of the holder. An opposite pair of these longitudinal apertures serve to receive through them a crooked handle rod to which may be secured, by wedges, either a saw or a series of lances, routers, or cutters, for cutting the groove in the barrel at the desired distance from its edge, and subsequently, in place of these cutters, a gouge for beveling the edges of the groove. These cutting devices project through one of the longitudinal apertures in the holder, at the rib having the same curvature as the barrel. The handle rod has a stud above its crook and a longitudinal flanged plate below, and fitting said rod and its plate, so as to be adjustable up or down thereon, is a handle plate having a hook for holding it in proper position on the rod plate. This handle plate being adjusted to rest on the end edge of the barrel, the croze is passed several times around the barrel to cut the groove, and afterwards similarly operated to bevel its edges.

Mr. Abiathar Blanchard, of South Norwalk, Conn., administrator of Dexter Dennis, deceased, has patented an improvement in hats. The object of this invention is to increase the strength and durability of hats made of chip and other materials. The sweat-band and brim lining of the hat are made in one piece, which may be of waterproof paper, and the same be glued or otherwise cemented to the brim and body of the hat, also be further secured, if desired, by the stitching that fastens the band to the hat-body. Said piece or lining may be first formed of annular shape, and its inner part, which is afterward bent upward, be scalloped or notched. Such combined lining and sweat band is free from

all folds or seams to press against and hurt the head of the wearer of the hat, which it materially serves to stiffen and strengthen.

IMPROVED CAR TRUCK.

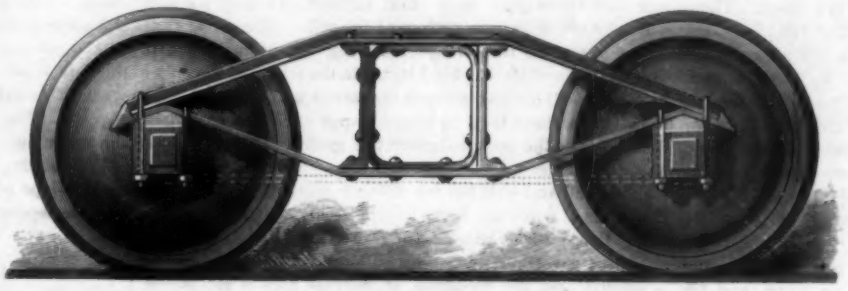
The common difficulty with ordinary iron car trucks is that the beams to which the axle boxes are attached will sag when the car is loaded, thereby twisting the axle boxes, tending to bring all of the pressure on the inner edge of the box. The engraving shows an improved car truck in which the beams to which the axle boxes are attached are made very rigid by form and arrangement of the bars of which it is composed.

The upper bar is bent or arched in the usual form, except at the ends; and the lower bar is bent sufficiently to join the upper bar at the ends where both bars are bent downward at an angle corresponding to the angle of the lower bar.

The axle boxes are sloped on the upper sides to correspond with the angle formed in the end of the beam, the apex of each box being on the vertical central line of the box. The upper and lower bars meeting at this point form a bearing which transfers the weight thrown on the beam or truss to the center of the box. The weight is thus evenly distributed instead of being secured by the inner edge of the box.

This construction remedies the great defect of the ordinary iron truck—that is, the tendency to sag down by the pressure of the load.

This improvement has recently been patented by Mr. Edward B. Meatyard, of Lake Geneva, Wis.



MEATYARD'S CAR TRUCK.

Cattle Restaurants.

The latest wrinkle in connection with the transportation of cattle is that of Mr. Tingley, of the Humane Live Stock Express Company. Some time ago the same gentleman invented a feed car, theoretically good but practically a failure. The grain and water were placed on the roof, and passed down by pipes when required; but the troughs in the crowded cattle cars got dirty, and the animals refused to eat out of them. An attempt was then made to substitute cars with compartments, so as to keep the cattle separate, but this rendered the cars unfit for any other purpose on the return trip, and was abandoned.

Mr. Tingley's present scheme is a simple one. It is to establish a number of "cattle restaurants" along each line of railroad that transports live stock. They will be two hundred miles apart, and the cattle can be fed and watered every twelve hours. When a train with a load of cattle on board gets within twenty miles of one of these restaurants, a telegram will be sent to the officer in charge, and when the train arrives everything will be in readiness. Great iron cups, about as large as and something of the shape of a good-sized kitchen pot, will contain food and water, run into them through rubber pipes from tanks above. The train will stop between two rows of these troughs, those on one side containing water, and those on the other side holding four quarts of food, consisting of a mixture of ground corn, oats, and cut hay. Each car will have sixteen openings on each side, all of which can be easily closed when the car—which need be nothing more than an ordinary cattle car, such as is at present used—is required for other purposes on the return trip. The device for moving the water and feed troughs to the openings is not complicated.

"Old Ironsides" Retired.

The historic frigate Constitution, for some time used as a school-ship, has been put out of commission as unseaworthy and beyond repair. She now lies at the Brooklyn Navy Yard.

The Constitution was one of the largest of six frigates whose construction was ordered by Congress on March 27, 1794. She was launched in October, 1797. She was built in Boston, of the best live oak, and cost $302,718. She began her career in the Tripolitan war in 1804, engaging against batteries mounting 115 guns at Tripoli, and her broadsides assisted in recapturing three hundred American sailors who had been captured by the Tripolitans from on board of the frigate Philadelphia. In the war against Great Britain, in 1812, she gained her famous victory over the British frigate Guerriere on August 19. On December 26 following, the Constitution had an engagement with the British frigate Java, and after a hot contest took her as a prize. The following year, on a cruise on the coast of Guiana and among the Windward Islands, she captured the British sloop-of-war Picton, a letter-of-marque, and several merchant vessels. She barely escaped being captured by a British fleet in 1814 by taking refuge in the harbor of Salem, Mass. On February 20, 1815, during another cruise, she captured, after an action of forty minutes, at night, the British frigate Cyane, and the British sloop Levant. The latter was recaptured by a British squadron off the harbor of Porto Praya, and Capt. Stewart, of the Constitution, fearing that the neutrality of the port would not be observed, ran away with his other prize. The Cyane arrived at New York in April, 1815, and the Constitution a month later.

Several years ago the ship was condemned by the Navy Department to be broken up, but gained a new lease of life through the publication of Holmes' poetic protest, familiar to every schoolboy.

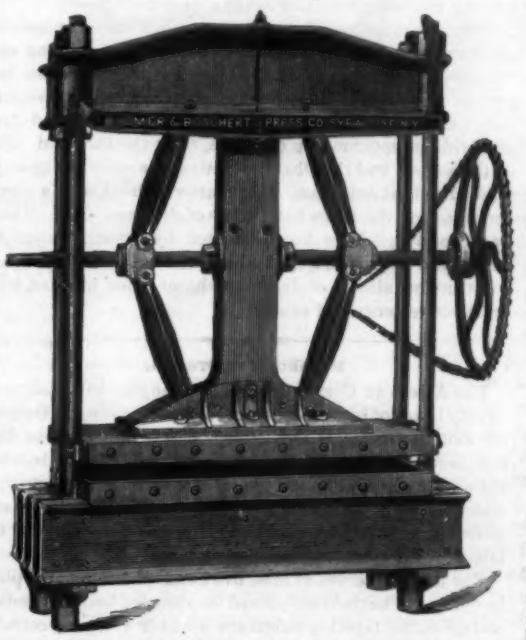
Preservation of Cross Ties.

Colonel A. Hanson, Superintendent of the Texas Central Railroad, has had creosoting works constructed at Houston, for treating cross ties, with a capacity of 700 pieces a day. The reservoir tanks are three in number, and will contain 4,000 barrels of crude oil. The cost of this oil is 11 cents in Galveston. The cost of each tie, when creosoted, is $1.10. The tanks are constructed of brick and Portland cement. The timber is loaded upon low tramway cars. These are drawn by machinery and an endless chain into the reservoir cylinders, which are then sealed, and the process is therein completed, after which the cars are withdrawn. In the yards of the company are immense quantities of bridge timber and ties awaiting treatment. One of the advantages of this process is the fact that the common loblolly pine, which is regarded of so little value, and which exists in such immense quantities in Eastern Texas and throughout many parishes in Louisiana, is the most suitable wood for creosoting, as it requires an open, porous timber and rapid treatment.

IMPROVED POWER AND HAND PRESSES.

This press is used for material requiring heat to vulcanize or otherwise properly finish it. It has two hollow plates, one of which forms the platen, and the other is placed on and forms part of the base of the press. These hollow plates are heated to any required degree by steam or hot air, and are planed smooth and true on the surfaces which come in contact with the material to be pressed.

The base of the press being made of four heavy 15-inch wrought iron I beams, bolted together with separators, is very rigid, and is designed to prevent the deflection of the lower steam plate when under great pressure.



BOOMER & BOSCHERT'S FIBER PRESS.

The principle for obtaining the pressure is the well-known device of a horizontal screw with right and left hand threads drawing the toggle levers to a perpendicular while it is held and controlled by the collars on the screw bearing against the central sliding standard. The press is well designed to withstand the great strain to which it is subjected. It is worked by power by a chain belt passing over a wheel on the end of the screw and being driven by a suitable countershaft. This press has an "indicator," showing at all times the amount of pressure being applied to the material under pressure.

The Vulcanized Fiber Company, Wilmington, Del., have recently put a press of this description, with plates 43 in. x 67 in., into their extensive works.

This is only one of the many uses to which the manufacturers of these presses have applied this principle, as they have been making a specialty of presses for many years, and are continually finding new uses for their machines and designing new styles to meet the demands of their customers. Their presses, being more simple and cheap, and capable of exerting enormous pressure, are rapidly superseding the hydraulic, which has long taken the lead.

Further information may be obtained by addressing Messrs. Boomer & Boschert, 96 West Water Street, Syracuse, N. Y.

Chloroforming During Sleep.

The possibility of chloroforming a person in sleep, without waking him, having been disputed in a recent murder trial, Dr. J. V. Quimby, of Jersey City, was led to test the question experimentally. The results were presented in a paper before the section of Medical Jurisprudence at the meeting of the Medical American Association, a few days ago. Dr. Quimby made arrangements with a gentleman to enter his room when he was asleep and apply chloroform to him. This he did with entire success, transferring the person from natural to artificial sleep without arousing him. He used about three drachms of Squibb's chloroform, and occupied about seven minutes in the operation.

The second case was a boy of thirteen, who had refused to take ether for a minor operation. Dr. Quimby advised the mother to give the boy a light supper and put him to bed. She did so, and Dr. Quimby calling when the boy was asleep, administered the chloroform and performed the operation without awakening the boy. The third case was a boy of ten years suffering from an abscess, and the same course was pursued with equal success.

Two important inferences may be drawn from these cases, Dr. Quimby said. Minor surgical operations may be done with perfect safety and much more pleasantly than in the ordinary way; and, secondly, a person somewhat skilled in the use of chloroform may enter a sleeping apartment and administer chloroform with evil intentions while a person is asleep. Hence the use of this drug in the hands of a criminal may become an effective instrument in the accomplishment of his nefarious designs. —*Medical Advance.*

An Exhibition of Postage Stamps.

An exhibition of stamps by a society in Vienna has brought out some curious information relative to its branch of postal affairs. Some of the collections exhibited were of considerable historical interest and value, notably that of Dr. Moschkau, collected during the Franco-Prussian war. It contained the stamps and the envelopes of the German and French field post-offices, and of the field post-office of the Swiss corps of observation, a postage stamp from Alsace, issued by the North German Bund, August 1, 1870, balloon letters from Paris and Metz, the photographically reduced letters for the pigeon post, stamps issued under Gambetta's dictatorship, and others by private firms who managed the postal communication during the Commune. He exhibited the first stamps of the German Empire and of the French Republic, and one which bears the head of the Count de Chambord, issued by the Legitimists in 1870, in anticipation of a Bourbon restoration.

Among the portraits of postal reformers which graces the walls of the exhibition were those of Sir Rowland Hill and the Duchess de Longueville. This heroine of the Fronde introduced envelopes in 1635 for letters carried by the Paris city post. Envelopes with an impressed stamp were used first in Sardinia in 1819. The Spanish stamps reflect, in the heads of Isabella, Amadeo, Don Carlos, and Alfonso, the dynastic changes that have taken place. A collection of Spanish stamps from 1850 to 1853 is valued at $150. The Austrian stamps, including those for Holstein under the Austrian occupation, and for Bosnia, amount to 2,262 specimens. There are 120 postal cards belonging to the General Postal Union, and a good collection of forged stamps was shown expressly for the benefit of collectors. The verdict of the visitors was that our stamp with the head of Washington was the most beautiful one in the exhibition.

In connection with this exhibition, some figures of the operations of the General Postal Union may be interesting. It extends to twenty-five States and to the British, French, and Dutch colonies. It forwarded, in the year 1879, 4,949,000,000 letters and cards. This total may be divided into 3,481,000,000 for Europe, 1,246,000,000 for America, 175,000,000 for Asia, 11,000,000 for Africa, and 36,000,000 for Australia. Including newspapers, printed matter, and samples, the Postal Union forwarded 6,776,000,000 packages, of which 5,285,000,000 belong to Europe.

Of the various European nations the English write the most letters. The figures for 1879 are 1,176,400,000 for England, and 553,000,000 for Germany. But the economical Germans sent 123,000,000 postal cards, while the English used only 114,000,000. It is reckoned that in the whole world the daily requirements are 13,000,000 letters and cards, giving every inhabitant of the globe a yearly average of 3½ written communications. The annual average of European countries for each inhabitant is: England, 36; Switzerland, 25; Germany, 18; Holland, 17; Belgium, 15; France, 14; Denmark, 13; Austria, 11. In England there is a post office for every 2,463 inhabitants; in Germany, for every 5,037; in Austria, for every 5,496; and in France, for every 6,242. Switzerland possesses the most post offices in proportion.

MISCELLANEOUS INVENTIONS.

Messrs. John M. Edmunds and Charles E. Wallin, of Salt Lake City, U. T., have patented a practicable and humane improvement in stock cars. This invention relates to means for holding up or supporting live stock during transportation by car, and consists in belts of leather or strong webbing attached to rollers arranged at the ends of the car, and passing over cross bars in the car, and through stirrups suspended from the roof, at such a height from the floor of the car as that said belts, when drawn taut by turning the rollers, will pass directly under the bellies of the animals, and so support and relieve the latter.

An improved wire stretcher for stretching the wires of wire fences, and which operates without injury to the wire, has been patented by Mr. Spencer W. Johnson, of Lathrop, Mo. In this device two plates hinged together at their one end, and provided with transverse grooves on their faces, in which the wires are placed, are drawn together by a clamping screw to hold the wire firmly between them. These grooves, which are coincident in the faces of the plates, are not made in a direct line across said faces, but are enlarged or rounded near the edges of the plates to form curved shoulders, over or against which the wire to be stretched is drawn, and whereby the wire will not be cut, bent short, or otherwise injured. The device is applicable to stretching either barbed or plain wire, and the power employed for stretching the wire may be transmitted through a lever passed through a ring attached to the device, or it may be otherwise applied.

An improved tool for drawing taut the wires of wire fences to fasten them to the posts of the fence, and for bringing together the ends of broken wires for the purpose of mending them, has been patented by Mr. Andrew Anderson, of Duck Creek, Ill. This tool consists in part of a main lever provided with points in the outer end surface of its operating arm for the purpose of engaging with the fence post when the tool is used to stretch or draw taut a wire, and in part of a lever jaw which is pivoted to the main lever. The outer end of this jaw is made diagonal to close against a diagonal offset of the main lever for grasping and holding the wire to be drawn taut by pressing the handle ends of the lever and jaw toward each other. Furthermore, said lever and jaw are formed with diagonal cutaway places in their faces, in which clamps are pivoted, for the purpose of securing between them the ends of a broken wire, and so that on bringing the lever and jaw forcibly together the ends of the wire lap sufficiently to form the twist or tie. Thus the same tool has a double use, which it performs perfectly.

Mr. Daniel Dockstader, of Fonda, N. Y., has patented an improved hay elevator. The carrier frame of this elevator is held in position, ready for loading the latter, by a catch pivoted to the underside of the track on which said frame moves, and such frame is fitted internally with a vertically sliding block, a catch, a notched dog with which the catch engages, and a sheave over which the free portion of the elevator rope or chain that carries the lifting pulley block passes, the fast end of said chain being attached to the carrier frame. These devices are arranged so that when it is desired to raise and move the loaded hay fork attached to the pulley block, by first pulling on the elevator chain or rope, the pulley block strikes and raises the sliding block, which releases the catch from the dog in the carrier frame, and also releases the track catch from the latter, and the dog when liberated engages with elevator chain to keep it from running back. The carrier frame with its attached load is then free to be moved as required. After the load is removed the carrier frame is moved back again for another load, and the sliding block, dog, and catches automatically resume their normal position. The action is a very perfect one.

Mr. Isaac D. Johnson, of Kennett Square, Pa., has patented an improved invalid bed. This invention embraces numerous improvements which conduce materially to the conveniences of the bed and comfort of the invalid. Among these may be mentioned a sliding frame with pivoted supporting bars and balancing devices for raising and lowering a hinged head section of the bed; a spring bolt and notched bar for use in connection with the cord which is employed to raise said head section, whereby, on releasing hold of the cord, the head section is locked in position and is unlocked by the act of pulling on the cord to adjust the section; a stretcher, made of canvas or other strips provided with tightening devices, and, in combination with the stretcher, a subjacent vertically adjustable mattress adapted to pass within the frame of the stretcher; a commode made capable of a longitudinal sliding adjustment beneath the stretcher and having special openings in it for removing the utensil and other purposes: and various other useful appendages.

Mr. Christopher Lewis, of Columbus, Ohio, has patented an ingenious feed device for rolling mills. This invention has reference to a previous invention by the same party, covering a rolling mill for rolling railroad rails, etc., in which the rail had a continuous passage through a succession of reversely moving sets of rolls, and was transferred from each pair of rolls to the next pair, by means of laterally adjustable buggies, whereby labor was economized and a rapid and practical automatic action secured. The present invention relates to the construction and arrangement of a feeder for such rolling mill, or a device for transferring the bloom to the furnace, and also from the furnace to the first pair of rolls; and to this end it consists, principally, in one or more buggies pivoted at one end in line with the first pair of rolls, and having its other end arranged to swing upon a curved track, so that it may be swung out to the line in which the bloom is withdrawn from the furnace and then returned to the line of feed to the rolls. The invention also consists in the combination with these swinging buggies of shafts, clutches, drums, and chains for operating them, and also in the combination of the supporting rollers of these buggies with devices for rotating them to advance the bloom whenever the buggy is thrown into line with the rolls.

A combined tooth and colter for grain drills, by means of which grain may be drilled in stubble land and sod without previous plowing, has been patented by Messrs. Barclay Thorn and James Evans, of Junction City, Mo. The device, which may be attached to any ordinary grain drill, consists of a tapering tooth, terminating in a triangular neck and a three-sided colter having its under surface plane and its upper surface sloping downward and backward from a central ridge, and its laterally extending wings rounded at the rear and converging to a point in front, whereby the said neck alone will cut the surface of the soil. The neck thus forms a narrow furrow for receiving the grain, which is dropped immediately behind it, while the wings of the colter loosen the soil on both sides of the furrow and allow the same to be thrust along their rearward slopes and escape around the angles of the neck to cover the grain. This improved tooth and colter may be used to great advantage, not only in stubble land and sod, but for drilling grain in timothy and clover lands when the latter have become partially barren.

Mr. Benjamin F. Sanders, of Boston, Mass., has patented an improved compound railroad rail, whereby stability is promoted and the repairing of railroad rails is facilitated. This rail consists of a cap bar and two side or base bars, arranged so that the joint of each bar will always be opposite two solid bars. The head of the cap bar sits down flat on the tops of the side bars, which latter are made with flanges upon the inner sides of their upper parts. These flanges, between which the stem of the cap bar passes, are beveled on their under sides, and the under side of the stem of the cap bar has outer flanges similarly beveled, whereby a dovetailed connection is formed between the three bars of the rail. The bases of the side bars, which have outer flanges that receive the spikes to fasten the rails to the ties, are so formed that the bodies of said bars incline inward. This construction, in concert with the dovetailed connection of the three bars, causes the side bars to draw down the cap bar to a firm bearing when weight is applied to the top of the rail. An anchoring plate, extending below the side bars, and having upper lugs which lap over inner flanges on the bases of the side bars, also serve to draw the upper parts of said bars inward, keys passing through the anchoring plate for the purpose. Plates are used in connection with these keys to restrain the bases of the side bars from spreading, and a stop bar is arranged between the side bars and made to engage with said bars and the cap bar, for the purpose of holding the latter bar from longitudinal movement.

Owing to their peculiar structure much inconvenience is experienced in handling heated plowshares for welding and for other purposes. This difficulty has suggested an improved tongs specially adapted to clasp and hold these articles. One jaw of these tongs is formed with a broad face and with an upturned lip or flange, to fit the face and sides of the shares, and the other jaw with a face piece and upward hooked or bent extension, which latter is fitted with a screw for adjusting the tongs to fit shares of different sizes. These improved tongs have been patented by Messrs. George M. Gillett and John Tucker, of Allerton, Iowa. Their peculiar construction allows of hot plowshares being handled with great convenience and ease.

Bamboo for Oregon.

The American Consul-General at Shanghai has lately sent twenty boxes of bamboo cuttings for transplanting in Oregon. He writes to the State Department that in the Chinese Empire, south of the Yang-tze, about sixty varieties of bamboo are said to grow, although five or six furnish the principal materials used. At Foochow and Swatow, the large size grows 40 to 50 feet high and 6 or 7 inches diameter; on the Island of Formosa it is found even larger.

The bamboo serves at least five hundred different purposes in China. The roots are carved into images, lantern handles, and canes, the tapering culms are used for every conceivable place where poles and ribs can be put; the leaves are worked into thatches, umbrellas, and screens; cut into splints, the wood is woven into baskets, plaited into awnings, and twisted into cables; the shavings stuff pillows; other parts supply chop-sticks for eating, beds for sleeping, brooms for sweeping, pipes for smoking, fuel for cooking, skewers for the hair, paper for writing, rods for whipping, tables to eat on, buckets for water drawing, and the tender shoots are highly esteemed as a vegetable to be eaten.

The Consul-General urges the naturalizing of the bamboo in the Southern States and on the Pacific coast.

Climate and Altitude.

The Virginia City *Enterprise* (Nevada) furnishes the following: The relations of climate to altitude are very intimate, but in most regions are not apparent—that is, not visible to the eye. Here, however, it is different. For instance, yesterday (November 15), while all the hills and mountains round about were arrayed in robes of dazzling white, there was in the center of the eastern landscape one big spot of brown. This was on the Carson River, down toward Fort Churchill. There not only the valley land, but also all the low bordering hills remained a deep and desolate brown. It was like a dirty spot left in the middle of a newly whitewashed wall. Although this spot is at no great distance from this city, the people there walk about on bare ground, while here we wade in a foot of snow. With them it is only late autumn; with us it is genuine winter. However, they have not far to go to get a taste of winter. Half a mile from their homes would take most of them up into the snow belt. Persons who have lived all their lives in prairie and other level regions have but an indistinct notion of the great influence altitude has upon climate. When their plains are bare, they do not know that winter is often but one hundred feet above their heads.

In this mountainous region we have an excellent opportunity of studying the effects of altitude. It is sometimes quite wonderful to observe the evenness of the snow line. It is drawn midway up the face of the whole line of hills as neatly as though marked with a chalk line. Sometimes it is higher, sometimes it is lower, owing to the temperature. The evenness depends a great deal upon the air. When there is much wind the snow line is not well defined, but when it is calm the strata of the atmosphere are perfectly regular. The snow line is then as level as though it were the water line of a lake.

Frequently, when no snow lies on our streets, we can see on the slope of Mt. Davidson, only 200 or 300 feet above us, the line separating us from the region of winter.

A BEAUTIFUL SIGHT.

The same paper, as above quoted, gives the following under the head of "Snow Streamers:" The peak of Mt. Davidson last evening presented a most wild and wintry appearance. The snow streamers were abroad in all their glory. Last evening, however, they could hardly be called streamers. They were in reality an unending series of whirlwinds that chased each other along the crest of the mountain. The spiral columns of snow took a thousand shapes in forming and vanishing. Being strongly lighted by the setting sun, the great surging columns looked like whirls of flame and illuminated smoke rolling up from a great fire. This brilliancy was seen in places where the rays of the sun passed through the thin mist of a single snow whirl. In places where three or four columns happened for a moment to fall in line between the spectator and the sun, the whole was black as the smoke from the funnel of a steamboat. Frequently several of the colors of the rainbow would flash out around these dark columns, and a moment after all above the peak would be deep red, giving the top of the mountain the appearance of an active volcano. It would have been a fine opportunity for a scientist interested in the study of atmospheric currents. The motions of these snow whirls show us what is always taking place in the air at the top of the mountain, both winter and summer, and if on our mountain, doubtless on all mountains of like height. The straight current of the atmosphere is broken up into thousands of little whirlwinds that rise from 50 to 200 feet above the surface of the ground.

Double Hybrid Worm-proof Cotton.

Mr. L. C. White, of Jasper, Jasper County, Texas, claims that after twenty years of study and experiment he has fully succeeded in producing a worm-proof cotton. Not only is the plant worm-proof, but it produces, he says, more and larger bolls to the stalk than any other cotton, matures earlier, and has a better staple and finer lint than any other cotton grown. He wants the government to pay him a million dollars for the seed and for his theory.

If his "double-hybrid," absolutely worm-proof cotton is all he claims for it, he should be able to make a million dollars selling seed to planters much quicker than he is likely to get such a sum from the Department of Agriculture.

Separate Sounds on One Wire.

M. Maiche has found by experiment that sounds of different characters produced from two separate sources can be sent simultaneously on one wire and received separately. He used at the receiving station two telephones of different resistances, and at the transmitting station caused a musical box to be set going on a microphone of small resistance, while an induction telephone transmitter was spoken into at the same time. The musical sounds were reproduced in the telephone which had the least resistance, and the vocal sounds in the other, so that with the two telephones to the ears the music could be heard by one ear and the speech by the other.

Tench for Central Park Lakes.

Capt. Auguste Briand, of the steamship St. Germain, lately presented to Superintendent Conklin twenty tench, to be placed in the ponds of Central Park. The tench had been twenty-five days out of their native waters in France, and the St. Germain had a rough passage, but the captain succeeded in keeping the fish alive and in good condition. The tench is highly prized as a food fish in Europe. It is of a beautiful greenish olive color, darker on the back than underneath. The fish average about two pounds in weight when grown. Like the carp, they like sluggish and muddy waters. It is believed that American waters can be stocked with them without difficulty.

Capt. Briand has successfully introduced catfish and sun fish from the Park lakes into France.

Department to be broken up, but gained a new lease of life | Their presses, being more simple and cheap, and capable of | proportion.

NEW FRET SAWING MACHINE.

This machine is made from entirely new designs, and avoids many of the difficulties experienced in the use of the ordinary suspension or "clear-sweep" scroll saws. It is a fact that five-sixths of all the curved sawing that is done is within the compass of an ordinary band saw arch, and it is for work of this kind that the portable machine shown in the engraving is especially adapted.

The arch is cast in one piece, in tubular form, and is sufficiently strong to sustain the saw rigidly against its work and resist the vibration caused by the action of the strain. The table is of kiln dried hard wood, firmly secured to a heavy tilting bar, so as to be adjusted for bevel sawing. The vibrating parts are of steel and wood, and while amply strong for the work, are extremely light, admitting of a high speed without special foundations for the machine. The strain is of steel, and is designed on a new principle, whereby an even tension is maintained on the blade throughout the stroke, and friction and wear are avoided. The crank plate is balanced for the pitman according to the best known methods. A combined brake and shifter is attached, by which the machine may be stopped almost instantly. Hardened steel guides are provided both above and below the table, and the blade is thus held rigidly in its track. The shaft is of steel, and runs in connected bearings of good Babbitt metal. The loose pulley is self-oiling, and has extra long hubs. The lower slide ways have rake adjustment, and the upper guide has adjustments in every direction. Ample provision is made for oiling all the working parts.

Careful attention has been paid in designing this machine to secure all the qualities desirable in a good high-speed jig saw, while avoiding many of those common to the old-fashioned suspension machine.

The No. 1 size has 4 m. stroke, saws 6 m. deep, and to the center of 84 inches. The pulleys are 6 m. in diameter, and may run 1,200 to 1,300 per minute. No. 2 has 5 m. stroke, saws 8 m. deep, and to the center of 100 inches. The pulleys are 6 m. diameter, and 3 m. face, and may run 1,100 to 1,200 per minute.

For further information address Frank H. Clement, 122, 124, 126 Mill St., Rochester, N. Y.

CLEMENT'S FRET SAWING MACHINE.

A Study of the World's Carrying Trade.

A statistician of ability has just produced a series of comparisons between the commerce, the railroads, the shipping, tonnage, and carrying power of the world, and contrasts the work accomplished in 1880 with that in 1850. If the commerce of the globe represented $4,280,000,000 thirty years ago, in 1880 it was $14,405,000,000, or there was the amazing increase of 240 per cent. To carry this augmented quantity, railroads have had 398 per cent more of mileage, while tonnage of ships has been made larger by a capacity represented in the thirty years by 171 per cent. In 1850, with 6,905,000 of ships' tonnage, the carrying power was 8,464,000 tons; last year it was 18,720,000, with a carriage capacity of 34,200,000 tons, or with the wonderful augmentation of 304 per cent.

Representing it in another light, for every $5,000,000 worth of commodities carried in 1850, there were 52 miles of railroad and a carrying capacity on the water of 9,900 tons. In 1880 these goods could be moved by 77 miles of railroad and 12,000 tons of shipping. What a vast power must be that of the United Kingdom, which represents a sea traffic that controls 49 per cent of the world's carriage!

It is the introduction of steamships which has so visibly increased the commerce, not so much by means of their tonnage as by their ability to multiply their carrying power. In compiling the tonnage entries of 1879 for all nations figures seemed to show that if the number of voyages made by a sailing ship in the year were 3½, a steamer made almost 17 in the same time. It is, therefore, assumed from the best of proof that the carrying power of a steamer is quite fivefold that of a sailing vessel. That this is quite evident is deduced from the fact of the decline in the building of sailing vessels, as they are becoming every day less profitable. When the proportions of steam and sail freights are considered, the first has gone up every ten years with rapid bounds, while the last has just as quickly gone down. In 1850, by steamer 14 per cent of the world's freight was carried, and by sail 86 per cent; in the next decade it was 29 and 71, in the next 43 and 57, and last year steam carried 61 and sail 39.

Distinguishing the steam tonnage of the world into the two simple categories of British and not British, the first, in 1880, has 2,580,900 tons, and all other nations 1,530,000 tons. There is something distressing when we look at the shrinkage of American shipping in studying the carrying power of England and our country. Comparing the aliquot carrying power of Great Britain with that of the United States, in 1850 we had 15 parts of the world's freighting business, while England had 41; in 1870 we had only 8 to England's 44, and last year it had dwindled to 6, while England's had augmented to 49.

When individual size and capacity of English steamers are examined with sailing vessels, the latter are one-fourth less in size than the first. Bringing together the differences in tonnage in 1880, English ships averaged 748 tons; French, 320; German, 250; American, 560; Norwegian 190; and Italian, 156.

It is undoubtedly true that the Suez Canal has caused a notable increase in size of steamers. Nine years ago the average tonnage of such ships passing to the Red Sea being 995, in 1880 it was 2,146 tons. When the Panama Canal is opened there is every reason to suppose that the impulse given to steam freighting will be notably increased, and we may look for additional vessels and of greater size.

If the world builds more ships, what is their term of individual life? Have we, by means of better material and additional skill in navigation, decreased the risks? Statistics seem to show that vessels belonging to the United States have the shortest existence. Mr. Kiaer, a Norwegian statistician, states that the life of a United States ship is 18 years, a French one 20, a German 25, an English 26, but that a Norse vessel has a good chance of 30 years. Averaging the wrecks into the two divisions of steamers and sailing vessels, the British average of the first was 2·94, and of the latter 3·93; against the American 4 and 5·45 per cent. If sailing vessels make 3 trips a year and steamers 15, a sailing vessel is good for 72 voyages and a steamer for 490. Vessels die, then, at the rate of 4 per cent a year, but there is a birth rate of 5 per cent; or 750,000 tons pass out of existence and are replaced every twelvemonth by 950,000 tons, though this hardly represents exactly the increase, since, as sailing vessels are taken away and steamships are substituted, and as these are being built of higher capacity, 4 per cent of increase must be added.

When the character of the accidents is noted, in 1880 there were to be counted in the bills of mortality of the world's shipping 101 vessels missing, 205 sunk by collision; lost by fire, 229; stranded and lost, 1,108; and waterlogged, 550; or a total loss of 2,193 ships. If the disasters of last year seem immense, when we consider how great has been the augmentation of shipping, it is satisfactory to learn that it was only 1 per cent over the average of the 14 preceding years.

Most curious are the speculations which are derivable from the dangers of the sea in respect to the individual. Not counting fishermen, the total number of sea-going vessels last year was thought to be not less than 90,000, and the estimate is that 1,000,000 people are always on the high seas. The rate of death from sea risks is considered to be about 3½ per cent per 1,000. If, then, a man lives in London, he would be subject to a death rate of 22 per 1,000, while if he was at sea it would be 25½. But if he lived in Dublin or Naples, his chances at sea would be better than on the land.

Counting the earnings of British sailors, some 200,000, as £60,000,000, it is equivalent to £300 for each per annum, while the shipowners get for their share £10,000,000. "That toll which all nations pay Great Britain for the carrying trade is equal to nearly 4 per cent of the exported value of the earth's products and manufactures."—*N. Y. Times.*

The Belgian Geographical Prize for 1885.

The King of Belgium has decreed a prize, to be offered in 1885, for the best system of popularizing the study of geography. The competition for the prize is to be international. Competitors may send their works, either printed or in manuscript, and either in the French, Flemish, English, German, Italian, or Spanish language, to the Minister of the Interior, at Brussels, before January 11, 1885. It is necessary that the prize manuscript shall be published in the course of the year following that in which the prize shall have been awarded.

Amalgams.

Opinion is still divided with regard to the nature of amalgams, some considering them to be isomorphous mechanical mixtures, others true chemical compounds. The former view derives support from those cases in which amalgamation is associated with an absorption of heat, as in the solution of a salt or in dilution of a solution; the latter is supported by the fact that many amalgams are formed with a strong development of heat. A contribution to the subject has been lately made by Herren Merz and Weith, in the Berlin Chemical Society. These chemists have investigated whether, with regular heating, amalgams part with their mercury continuously or in distinct gradations.

The experiments consisted in placing the amalgam in a porcelain dish within a glass tube, contracted below, and inclosed in a second tube, having a bulb at its lower end. This bulb of the outer tube contained the substance of the vapor bath (sulphur, mercury, or diphenylamine). To guard the amalgam from air, a lively current of an indifferent gas was passed through the interior tube while the experiment lasted. The amalgams used, which were always directly produced by known methods, contained on an average 60 to 80 per cent of mercury. This heating was continued, wherever possible, until after several hours no decrease of weight (or hardly any) was perceptible. There were examined gold, silver, copper, lead, tin, bismuth, zinc, cadmium, sodium, and potassium amalgams. The results for the first eight are very briefly communicated, those for the last two, whose easy oxidability required special precautions, more fully. In the case of these alkali amalgams, the authors also sought to determine the melting points, but, for certain reasons, very accurate results were not reached. In general the melting points of the amalgams rise at first very quickly with the proportion of alkali metal, then gradually fall. It was thus observed that, when mercury is heated under paraffin to 250°, and then some sodium is added in portions, the whole mass solidifies with four to five per cent of sodium; but with further addition of some percentages the mass fuses completely.

The results of their investigation are summed up by the authors as follows: A survey of the results described shows, for a series of amalgams, that even with moderate heating they do not furnish determinate compounds.

The amalgams of gold, silver, copper, bismuth, lead, tin, zinc, and cadmium lose their mercury entirely, or nearly so even at or under the boiling temperature of mercury. Where no mercury remained, the cause is to be sought rather in a mechanical exclusion than in a chemical action. But, on the other hand, the easy decomposability of these amalgams evidently offers no proof that there are no chemical compounds in them.

For the rest, if we consider the great variability of amalgams, together with the fact that, in squeezing the so-called mercury solutions of metals, these latter do not remain behind, but certain mercury compounds, the view acquires the greatest probability, that at least very many amalgams may be, indeed, molecular combinations, but in fixed relations.

Most pronounced does chemism appear to be in the amalgams of potassium and sodium. They lose their mercury extremely slowly, even at the boiling point of sulphur, as also in a gas current, and so in circumstances highly favorable to removal of mere mixed substances. The remarkable relations, too, as regards the melting point, seem to speak for the presence of true chemical compounds. Probably these amalgams, at a comparatively low, as well as at a high temperature, consist of different compounds, none of which, however, have a durable existence, and therefore recurrent, fixed relations of composition are not to be met with. Alkali-metal amalgams of fixed composition would probably be obtained on production of larger quantities of amalgam; perhaps also by heating considerably above the boiling temperature of mercury.

The Decline of Irish Industries.

The revival of Irish manufacturing industries, largely destroyed by hostile legislation, is much agitated. The statistics of the decline are given as follows:

In 1800 there were in Dublin 91 master woolen manufacturers and 4,918 hands; in 1840, 12 masters and 602 hands, 30 master woolcombers and 230 hands; in 1834, 5 masters and 66 hands. The carpet manufacturers in 1800 were 13 masters and 720 hands; in 1841, 1 master. The blanket manufacturers in Kilkenny in 1800 were 56 masters and 3,000 hands, in 1822, 42 masters and 925 hands. The broad silk loom weavers in Dublin in 1800 at work were 2,500; and in 1840, 250. The calico looms in Balbriggan in 1799 in full work were 2,000; and in 1841, 226. The flannel looms in the County of Wicklow in 1800 were 1,000; in 1841, not one. The case of the Cork braid weavers, worsted weavers, hosiers, woolcombers, cotton weavers, linen check weavers, was even worse. These industries employed thousands of hands up to 1820; now there is nothing left but a few wheezy hand looms near Shandon Church and an almost extinct colony of calico weavers at Clonakilty. The linen trade once throve in Mayo, but there is not a trace of it now.

THE ÆTNA PATTERN GRATE BAR.

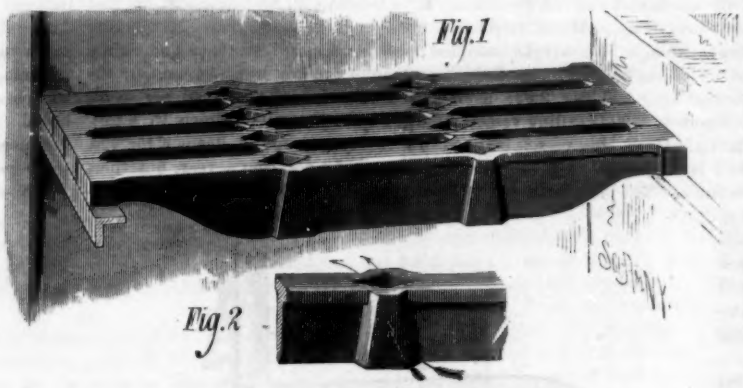
We give an engraving of an improved boiler grate bars of which the special feature is an expansion shoulder that secures the grate against twisting, buckling, and warping. Engineers always notice that for some time after a new set of grate bars are put under a boiler the fire is more uniform and the consumption of fuel perceptibly less, this being due to the regular and evenly divided openings in the grate surface, which give a uniform and well distributed quantity of air, thus securing perfect combustion. It is, however, but a short time before the bars begin to twist and warp out of line; this is caused by the solid shoulders preventing the necessary expansion sideways, resulting in large openings between some bars and corresponding smaller openings between others.

The smaller openings do not furnish sufficient air for proper combustion, while the larger openings admit too much air and waste considerable fuel by allowing it to drop unconsumed into the ash box.

Too much care cannot be used with reference to the grate bars under a boiler, as here usually is the greatest waste about an establishment, and where the cost of fuel is an item, the price of a set of grate bars is nothing compared to the waste in fuel caused by incomplete combustion

Various devices have been patented to obviate these difficulties, but most of them are complicated and expensive, and, therefore, have not come into general use.

All engineers will agree that of the common grates those are best which are cast single, being moulded on the side, thus securing the best metal on the face of the bar.



THE ÆTNA PATTERN GRATE BAR.

The Ætna bar is a single piece with a diamond opening cored through the shoulders, so that each bar will take up its own expansion and thus prevent twisting and warping. These bars are cast on the side, and are made from metal especially adapted to contact with fire.

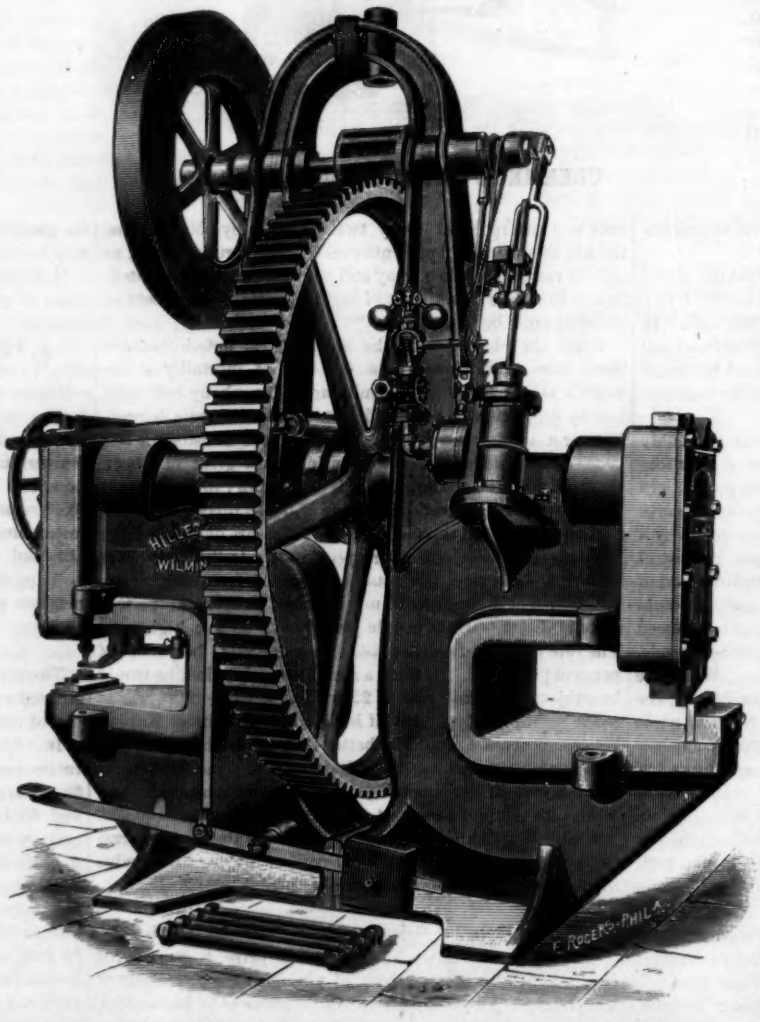
Another great advantage of the Ætna bar is, that though somewhat lighter than the common bar it is stronger and vastly more durable, and as it is sold at the same price per pound, is therefore cheaper, the manufacturers are thus enabled to make a specialty of these bars and use a special mixture of iron suitable for this purpose. The Ætna grate bars are manufactured by the Ætna Iron Works, Quincy, Ill.

IMPROVED PUNCH AND SHEAR.

We give an engraving of a powerful punch and shear made by Messrs. Hilles & Jones, Wilmington, Delaware. This particular machine is provided with an engine permanently attached to the frame, but they are made either with or without the engine, and are furnished in several sizes. When driven by a belt appropriate pulleys are supplied. The machine is provided with a clutch arrangement controlled by a foot lever, by means of which the punch can be stopped and started. For very particular work a hand wheel is used to set the punch before applying the power. The engraving gives an excellent idea of the construction of these machines.

No. 0 will punch ¾ inch hole in $\frac{5}{16}$ inch iron, 18 inches from edge, and shear ⅜ inch iron. No. 1 will punch ¾ inch hole in ½ inch iron, 20 inches from edge, and shear ½ inch iron. No. 2 will punch 1 inch hole in ¾ inch iron, 20 inches from edge, and shear ¾ inch iron. No. 3 will punch 1¼ inch hole in 1 inch iron, 25 inches from edge, and shear ⅞ inch iron. No. 4 will punch 1½ inch hole in 1¼ inch iron, 25 inches from edge, and shear 1⅛ inch iron.

Messrs. Hilles & Jones are prepared to supply either the punch or the shear separately, and of heavier or lighter patterns.



HILLES & JONES' COMBINED PUNCH AND SHEAR.

Substitute for Cod-liver Oil.

It is claimed by a writer in *Nature* that the oil of the "oolachen" or "ulikon," the candle-fish of Alaska, possesses all the medicinal qualities of cod-liver oil. This fish has long been an ichthyological curiosity, and has been noticed by almost every traveler who has visited the coasts of British Columbia and Southern Alaska. It is a small silvery fish, averaging about fourteen inches long, and in general appearance much resembling a smelt. It is the fattest of all known fish, and affords a very superior oil when tried out. Dried, the fish serve as torches. When a light is needed, the tail is touched to the fire, and they will burn with a bright light for some time. No description can give an adequate idea of their numbers when ascending the rivers from the sea. The water is literally alive with them and appears to be boiling. These fisheries appear not to have been hitherto utilized except by the natives, who esteem the ulikon as a great delicacy. The oil at present is said to be gaining a high reputation in this country, and has recently been introduced into England, where it will probably take "a prominent place as an important medicine."

The Value of Wide-awake-itiveness.

A certain degree of tension is indispensable to the easy and healthful discharge of mental functions. Like the national instrument of Scotland, the mind drones woefully and will discourse most dolorous music, unless an expansive and resilient force within supplies the basis of quickly responsive action. No good, great, or enduring work can be safely accomplished by brain force without a reserve of strength sufficient to give buoyancy to the exercise, and, if I may so say, rhythm to the operations of the mind. Working at high pressure may be bad, but working at low pressure is incomparably worse. As a matter of experience a sense of weariness commonly precedes collapse from "overwork;" not mere bodily or nervous fatigue, but a more or less conscious distaste for the business in hand, or perhaps for some other subject of thought or anxiety which obtrudes itself. It is the offensive or irritating burden that breaks the back. Thoroughly agreeable employment, however engrossing, stimulates the recuperative faculty, while it taxes the strength, and the supply of nerve force seldom falls short of the demand. When a feeling of disgust or weariness is not experienced, this may be because the compelling sense of duty has crushed self out of thought. Nevertheless, if the will is not pleasurably excited, if it rules like a martinet without affection or interest, there is no *verve*, and, like a complex piece of machinery working with friction and heated bearings, the mind wears itself away and a breakdown ensues. Let us look a little closely at this matter.—*Dr. J. Mortimer Granville on "Worry"—Popular Science Monthly.*

NEW INVENTIONS.

An improvement in rail fences, which admits of the fence being laid in a straight line, and effects a great saving in labor and fence material, has been patented by Mr. Leonard J. Murphey, of Wauseon, Ohio. This improvement consists in a combination with the post and rails of a fence of a rectangular frame composed of vertical side bars and horizontal bars secured at their ends to the side bars, and at the center of their length to the post, whereby spaces are formed on each side of the post for the reception of the rails, which need not be secured.

Mr. James Denton, of Amsterdam, N. Y., has patented an improved attachment for knitting machines. The improvement is designed to provide for making knit fabrics with horizontal, vertical, or diagonal stripes, or other patterns of one or more colors, without breaking the thread whenever the color is to be changed. The machine to which the attachment is to be applied has the usual barbed knitting needles, and a sinker and a presser wheel operating in combination with needles. It also has a thread guide, through which duplicate threads pass, attached to the bearing of the presser wheel. The attachment, which operates in concert with these devices, has a vibrating looped lever for guiding one of the threads and for exposing it on the outside of the fabric, a supplemental lever connected to the looped lever, a reciprocating adjustable cam which is removably secured to the supplemental lever, and a pair of wheels, operated one by the other, and provided with detachable laterally projecting pins for giving a reciprocating movement to the cam and vibratory movements to the levers, for the purpose of making stripes and other patterns, the number of detachable pins employed regulating the exposure of the thread carried by the looped lever in the pattern. For making different patterns, various changes require to be made, and numerous other details enter into the general combination, which is very ingenious.

William Driscoll, of Taunton, Mass., has patented an improved mould for forming crucibles and other articles of plastic material. This invention relates to moulds for forming crucibles and articles of pottery ware, and it consists in a skeleton frame mould provided with a lining or backing of flexible and porous material. It is preferred to use both a lining and a backing, the latter being of heavier and coarser material than the lining. Springs also may be combined with a two-part mould, for separating the mould after clamping hoops for binding it together have been removed. By employing a porous backing, the water pressed from the composition can escape freely, and the lining will be retained in a comparatively dry condition.

An improved bed attachment for invalids, by which bed-ridden persons may be easily and comfortably attended, has been patented by Mr. Joshua P. Brown, of Crockett, Tex. This invention consists, principally, of a frame pivoted between the side boards of a bedstead and which is provided with a removable seat, the same being adapted to be brought into a vertical position for supporting the invalid in a sitting posture. The head piece and side arms of this frame have secured to them a supporting strip of canvas, which is fastened at its bottom to a sheet of like material that is firmly secured at its front end to the head-board of the bedstead, and passes at its opposite end over a roller, by which it may be slackened, or be stretched and held taut, accordingly as it is desired to adjust the invalid into a sitting or a recumbent position. These two canvas attachments, which form the back of the frame, constitute the bed bottom, on which the mattress may be placed. The removable seat consists mainly of an upper board having an opening in it which may be covered by a pivoted cushion, a bottom board provided with means for holding a utensil, and flexible or hinged connections between said boards. This seat is supported by the side arms of the pivoted frame and constructed to engage with hooked hinged arms which serve to retain the seat in position between the side arms of the frame, and so form an easy and secure support for the patient.

An improved bail for handling barrels, which greatly economizes labor and facilitates the movement from place to place of filled barrels, has been patented by Messrs. James Casey, Sheldon Juniper, and John H. Mitchell, of Savannah, Indian Territory. The invention consists of a handle rod sliding in a bar to the ends of which are pivoted two angular arms having studded and swiveled griping plates at the lower ends, to which handle-rod the upper slotted ends of the bent arms are held loosely, said handle-rod being provided with a series of transverse grooves, in which a latch pivoted on the transverse bar catches. The swiveled griping plates are pressed

against the ends or heads of the barrel, and are held in place by the latch, the barrel being rolled or trundled by means of the handle-rod.

An improved window reflector or mirror, which is readily adjustable in its inclination to the window and in its inclination to the vertical plane, to provide for exhibiting objects at a greater or less distance and at different heights from the ground, has been patented by Mr. Andrew G. Moodhe, of Stillwater, Minn. The invention consists in a window reflector composed of two mirrors, each pivoted at the middle of the adjoining ends to a plate in which a small shaft is loosely mounted, having a hand wheel on one end and a pinion at the other end, which pinion engages with two curved racks pivoted to the inner sides of the mirror, whereby the inclination or angle of these two mirrors will be varied by rotating the pinion. The lower ends of the mirrors are connected by small wires with a transverse strip pivoted to the lower end of the plate to which the mirrors are pivoted, and provided with a small shaft with a hand wheel at the end for changing the vertical inclination of the mirrors.

Mr. Jacob R. Scott, of Nyack, N. Y., has patented an improvement in machines for sewing boots and shoes, which supplies a desired need in a very simple manner. This invention relates to sewing machines for sewing boots and shoes, or materials varying in thickness, and its object is to obtain a variable stroke of the needle regulated by the movement of the presser bar, according to the thickness of material being sewed. The invention consists in a cam sleeve fitted for movement by a cam on the presser bar, and arranged to raise the fulcrum post of the needle bar as the presser bar is raised, so that the presser bar being positioned by the thickness of material, the fulcrum post of the needle is correspondingly positioned.

An improvement in invalid bedsteads, which provides for the more convenient adjustment of the pivoted head, back, and leg or foot rests of the bed, and for the use of suitable vessels with its mattress for the relief of the patient, has been patented by Mr. George B. Davis, of Richmond, Va. This invention consists in a combination with a pivoted head and back rest, of one or more springs for holding said rest in an inclined position when the patient is resting thereon, and a strap passing over a pulley or roller and secured by a buckle, for compressing said spring to vary the inclination of the rest and to hold it in any desired position. The foot rest of the bed is also pivoted, and may be raised or lowered and held by a strap. The invention also consists in the combination with the mattress having a hole in it for the use of a suitable utensil below it, of a cushion or pad closing said hole, and levers for supporting the pad when closing the hole, and providing for its removal out of the way when necessary to expose said hole.

IMPROVED FIRE ESCAPE.

The recent calamitous fire in the Ring Theater, at Vienna, in which more than seven hundred human beings were destroyed; the burning of the Brooklyn Theater, in which more than three hundred persons lost their lives; and the frequent occurrence of catastrophes of this kind, demand the provision not only of all possible means of preventing and extinguishing fires, but also of every practicable way of escape from the burning building.

In most theaters and places of amusement the ground floors are provided with exits on the ground, level or at least within a short distance of it, but the galleries are usually destitute of sufficient means of escape.

The engraving shows a device patented by Mr. J. F. Werner, of 62 Center Street, New York city, which is intended to meet this particular case.

The invention consists, mainly, of a movable floor, suspended by chains from near the ceiling of the entrances, halls, and vestibules, or by hinges on the side walls, and lowered in case of fire, to be supported on projecting rests of the side walls, at suitable height above the floor. Sliding extensions and swinging stairs and rear sections connect with the ground outside of the door, and with the staircases of the gallery, so as to form separate exits above the regular entrances.

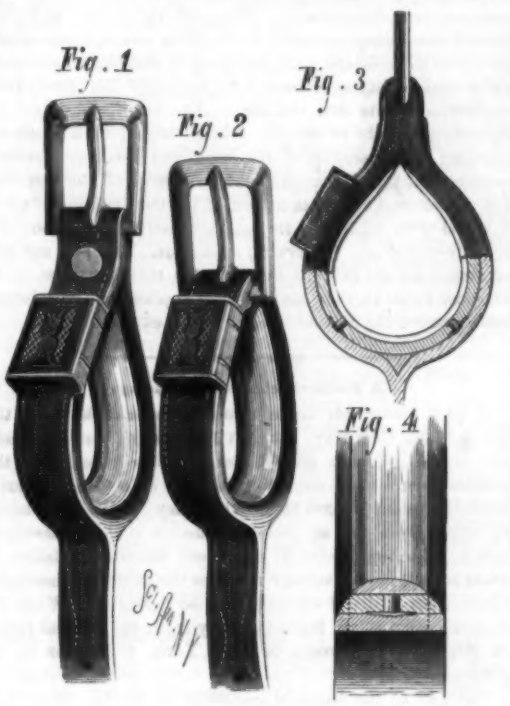
In case of fire the floor is lowered, the swinging sections and stairs swung down, and thereby a second passage formed, which is mainly designed for the people in the galleries, so that they may pass out simultaneously, and without interfering with the people in the parquet.

As it is a matter of experience that the greatest delay in the passage of the people is caused by the choking up of the entrances by the persons rushing out from the parquet, so that those in the galleries have less chance of escape, it is obvious that a practical means by which direct and unobstructed exit for the people in the galleries may be obtained will in a great measure obviate the danger arising from the present defective construction of our theaters. The means described change every entrance hall of a theater into two passages, so that the people may get out in half the time. The galleries are quickly emptied by means of the fire escapes of the entrances, the people being compelled by the bridge sections to pass on to and over the movable floors and their extensions and stairs to the outside of the building. If desired, additional movable stairs, running parallel to and being suspended in analogous manner to the movable floor, may be arranged in the lower parts of the staircases of the galleries, so that they may also be divided in their height into two passages, that form additional safety devices for the people.

WERNER'S FIRE ESCAPE.

IMPROVED THILL TUG.

The engraving represents an improved thill tug recently patented by Mr. Charles B. Pineo, of Bar Harbor, Hancock County, Me. In this device the strap which surrounds the thill is provided with a rigid metallic lining, which is somewhat narrower than the strap, and is made inwardly convex, so as to take the friction and wear of the thill. The lining also keeps the loop distended, so that it is not drawn tightly against the sides of the thill.



PINEO'S THILL TUG.

The advantages secured by this improvement are, that the thill tug wears much longer than the ordinary leather tug, and, as it is impossible for it to catch on the thill, the horse can go out of the thills unharnessed, whereas with the ordinary tug it is a common thing for it to catch, and, by sliding the saddle, make the horse's back sore.

This new thill tug can be put into the finest harness without injury to its appearance, as it almost invisible when the thill is in the tug, and it is incapable of marring the thill, as it has no sharp metallic edges.

The metallic lining is fastened to the leather lining by four rivets or pins cast on the metal lining. These pins pass through the leather lining and are provided with a bar and headed down.

The engraving shows two forms of thill tug; one (Fig. 1) with the leather straps riveted together below the buckle, the other (Fig. 2) with the buckle at the end of the loop. Fig. 3 shows a side view of the tug partly in section, and Fig. 4 is a vertical transverse section.

Tannic Acid by Dialysis.

Kohlrausch sets out with the law that equalization takes place between liquids f different concentration, and for this reason, in tanning leather, when tannic acid particles have been dissolved in the lye, they reach all parts of the surrounding liquid and reach the leather, penetrating its membranes by osmotic action. Part of it unites with the fibers, while part of it is deposited between them. This action is an uninterrupted one, and is repeated as long as the fibers are able to take up more tannic acid, or the solution to give up more. From these considerations Kohlrausch concluded that, not only does the tannin get into the hide by osmosis, but that it must pass through the permeable membrane of the plant cells in a similar manner, since by the chemical and microscopic examination it is seen that the interior and uninjured cells act just the same as the external pieces of thick bark that have been used. Hence it cannot be a simple solution of the tannin that has been exposed by grinding the bark which reaches the hide and is taken up by osmosis, but there must also be dialysis, partially free and partially membranous, of the tannin, the latter taking place through the permeable membrane of the plant cells, just as it does through the animal membrane of the hide.

These hypotheses have been confirmed by practical experiments, and a large factory has been built in Vienna and is working profitably by this method. The rasping and grinding of the bark is no longer necessary, since it can be used in larger pieces. The dialysis of the tannin takes place in a battery of closed vessels. The loss that was unavoidable in the old process, owing to decomposition setting in, is here reduced to a minimum by excluding the air. Generally about 96 to 97 per cent of the tannin is obtained, as in gall-nuts, and even in pine and fir barks, where the rosin that accompanies it renders its extraction more difficult, they claim to get 92 per cent, and from the oak bark 100 per cent of its tannin, while by previous methods the loss approached 40 per cent. The new process threatens to revolutionize the whole tanning operations, but especially the manufacture of extracts, not only of tannin, but also of most vegetable dyestuffs soluble in water or alcohol. D. J.

Antarctic Whales.

With regard to animals, we saw not a single seal on the ice or in the water during our southern trip. No doubt we did not go far enough south or sufficiently among the pack ice to meet with them.

When we were off the pack ice, and especially when we neared the Antarctic Circle, whales were extremely abundant, apparently all of one species, a "finback," probably the southern "finner" (*Physalus australis*). I saw no right whale among them at all.

As these whales moved under water close to the ship the light reflected from their bodies lighted up the water around and enabled one to follow their movements.

I several times went away in a small boat from the ship to shoot birds for our collection. On these occasions the whales sometimes blew quite close to the boat.

The appearance of a whale's spout, as seen from the level of the sea, is very different from that which it has when seen from the deck of a ship; it appears so much higher, and shoots up into the air like a fountain discharged from a very fine rose. The whale, of course, in reality does not discharge water, but only its breath: this, however, in rushing up into the air, hot from the animal's body, has its moisture condensed to form a sort of rain, and the colder the air, just as in the case of our own breath, the more marked the result. When the spout is made with the blowhole clear above the surface of the water it appears like a sudden jet of steam from a boiler.

When effected, as it sometimes is, before the blowhole reaches the surface, a low fountain, as from a street fire plug, is formed, and when the hole is close to the surface at the moment, a little water is sent up with the tall jet of steam.

The cloud blown up does not disappear at once, but hangs a little while, and is often seen to drift a short distance with the wind.

The expiratory sound is very loud when heard close by, and is a sort of deep bass snort, extremely loud and somewhat prolonged; it might even be compared to the sound produced by the rushing of steam at high pressure from a large pipe.

Smaller cetaceans, probably of a kind of grampus (*Orca*) were very common near the Circle. These had a high dorsal fin placed at about the middle of the length of their bodies. Immediately behind the fin there was a large white saddle shaped patch, extending across their back, and they had, further, a conspicuous white blotch on each side, just behind the head and in front of the flippers.

The white patches contrasted strongly with the dark general color of the body.

These grampuses swam about in small shoals, with their high dorsal fins projecting far out of the water, like those of sharks do sometimes, and also those of swordfish.

The grampuses seemed habitually to swim thus, and the group of pointed sickle-shaped black objects moving through the water had a curious appearance at a distance. I cannot

natives, who esteem the ulikon as a great delicacy. The oil at present is said to be gaining a high reputation in this coun

ter.—*Dr. J. Mortimer Granville on "Worry"—Popular Science Monthly.*

loosely, said handle-rod being provided with a series of transverse grooves, in which a latch pivoted on the transverse bar catches. The swiveled griping plates are pressed

identify this grampus with a described species.—*H. N. Moseley, Notes on the Challenger.*

"Cold Catching."

It is noteworthy as a curious yet easily explicable fact, that few persons take cold who are not either self-consciously careful, or fearful, of the consequences of exposure. If the attention be wholly diverted from the existence of danger, by some supreme concentration of thought, as, for example, when escaping from a house on fire or plunging into cold water to save life—the effects of "chill" are seldom experienced. This alone should serve to suggest that the influence exerted by cold falls on the nervous system. The immediate effects of a displacement of blood from the surface, and its determination to the internal organs, are not, as was once supposed, sufficient to produce the sort of congestion that issues in inflammation. If it were so, an inflammatory condition would be the common characteristic of our bodily state. When the vascular system is healthy, and that part of the nervous apparatus by which the caliber of the vessels is controlled performs its proper functions normally, any disturbance of equilibrium in the circulatory system which may have been produced by external cold will be quickly adjusted. It is, therefore, on the state of the nervous system that everything depends, and it is, as we have said, on the nervous system the stress of a "chill" falls. Consciousness is *one* element in the production of a *cold*, and when that is wanting the phenomenon is not very likely to ensue.

It is in this way that persons who do not cultivate the fear of cold-catching are not, as a rule, subject to this infliction. This is one reason why the habit of wrapping-up tends to create a morbid susceptibility. The mind by its fear-begetting precaution keeps the nervous system on the alert for impressions of cold, and the centers are, so to say, panic-stricken when even a slight sensation occurs. Cold applied to the surface, even in the form of a gentle current of air somewhat lower in temperature than the skin, will produce the "feeling" of "chill." Conversely a thought will often give rise to the "feeling" of cold applied to the surface—for example, of "cold water running down the back." Many of the sensations of cold or heat which are experienced by the hypersensitive have no external cause. They are purely ideational in their mode of origination, and ideal in fact.—*Lancet.*

Effect of Compression on Solids.

According to the *Revue Scientifique*, Mr. W. Spring, a German chemist, has recently published an interesting memoir, giving the result of a series of experiments undertaken to ascertain the effect of powerful compression on the most diverse bodies.

The substances experimented with were taken in the form of fine powder, and submitted, in a steel mould, to pressures varying from 2,000 to 7,000 atmospheres, or about 7,000 kilogrammes per square centimeter. The facts observed are given in a series of tables, from which we extract some of the more curious results.

Lead filings at a pressure of 2,000 atmospheres were transformed into a solid block, which no longer showed the least grain under the microscope, and the density of which was 11·5, while that of ordinary lead is 11·3 only. At 5,000 atmospheres the lead became like a fluid and ran out through all the interstices of the apparatus.

The powders of zinc and bismuth, at 5,000 to 6,000 atmospheres, gave solid blocks having a *crystalline* fracture. Toward 6,000 atmospheres zinc and tin appeared to liquefy. Powder of prismatic sulphur was transformed into a solid block of octahedric sulphur. Soft sulphur and octahedric sulphur led to the same result as prismatic. Red phosphorus appeared also to pass into the denser state of black phosphorus.

As may be seen from this, simple bodies undergo chemical transformations by the simple action of pressure. The change of amorphous powders, like that of zinc, into crystalline masses, is a sort of self-combination. Certain hard metals do not lose their pulverulent structure at any pressure.

Binoxide of manganese and the sulphides of zinc and lead in powder weld when compressed, and exhibit the appearance, respectively, of natural crystallized pyrolusite, blende, and galena; while silica and the oxides and sulphides of arsenic undergo no agglomeration.

A certain number of pulverized salts solidify through pressure and become transparent, thus proving the union of the molecules. At high pressures the hydrated salts, such as sulphate of soda, can be completely liquefied. Various organic substances, such as fatty acids, damp cotton, and starch change their appearance, lose their texture, and consequently undergo considerable molecular change.

The Berlin Sanitary Exhibition.

Preparations for the coming exhibition of sanitary engineering and life-saving appliances in Berlin are going on rapidly. The greater part of the exhibits, especially those which will not bear exposure to the weather, are to be put in the main building, while others will find suitable places in the adjoining halls. The arrangement of the exhibits is a new one. Objects relating to each other will be combined in such a manner that the visitors may understand the purpose and application of each article at one glance. One part of the building represents a battlefield. On the wall is a picture of a battle, and in front of it are set up figures representing ambulances, soldiers, physicians, and attendants, and instruments and apparatus of all kinds relating to the attendance and transportation of wounded soldiers. In another part a public bath in the ancient style is represented with the necessary equipments, to show what progress in the care of public health was made in ancient times as compared with modern. A part of the ground is dug out so as to form a pond, in which diving and other methods of working in and under water are shown with the apparatus on exhibition. As in the case of the Industrial Exhibition of 1879, some of the large arched halls of the city railways are used as exhibition rooms. Some of them will be transformed into mines, to be lighted partly by luminous paint, partly by mine lamps, and partly by electric light, and provided with safety appliances and apparatus for protection against accidents and the like. The town committee of Hamburg intends to exhibit a large model of a steamer, showing a cross section of the same, and fitted up in such a manner that the visitors may enter all parts of the vessel to get a clear and complete notion of the construction of such a vessel with regard to its sanitary contrivances, comfort, and life-saving and preserving apparatus. This new method of arranging the exhibits according to their purposes, so as to show them in the place of their application, will doubtless augment the general interest of the exhibition.

A Panic-Stricken Company.

A new terror has come upon the stockholders in the Keely Motor Company. It isn't the thought that Mr. Keely is a fraud. That is an old idea, and too hopeless for the gentlemen who paid over their money in return for motor stock, knowing a good thing when they saw it, to permit it to form a prominent subject of discussion at their interesting and bewildering meetings. It is not the contemplation of what is, that on the surface troubles the minds of these gentlemen, but a dread of what may be hereafter. What the matter really is we learn partially from the annual report of Mr. Enos T. Throop, of New York, a director in the company.

First, as to the financial condition of the enterprise. In return for the money spent in the past, of course these gentlemen have their experience, which is no doubt very valuable. The present status looks encouraging. The liabilities are only $1,360.75. The resources are 12,000 shares of Keely motor stock, 3,000 shares of the Keely Motor Company's Mexico stock, and cash, $19.48. But while this condition of affairs seems satisfactory for the present, it does not guarantee the future; and, indeed, over this future a dark cloud is hovering. This great invention of Mr. Keely's is not absolutely complete. There is no immediate prospect of its being completed. There are no patents for it, and nobody but Mr. Keely pretends to understand it. He is still groping for the evasive contrivance that will set everything working according to the original expectation; and his mind is scattered over so many inventions that this one cannot receive his constant attention. With these facts before them, the stockholders demand of Mr. Keely either to get out his patents or to explain his invention to some other person. What drives them to this course is shown in the following extract:

"He has repeatedly said that he shall impart this information, and that so soon as he shall bring them to perfection or to that stage determined upon in his own mind. This portion might be conceded by us if a limit could be assigned to his inventive genius; but, considering the nature of the agent he is working with and the grave possibilities of the future, we fear that death or even a worse calamity may overtake him."

Of course, if Mr. Keely dies, all the beautiful machinery required in his experiments, and the well-engraved certificates of stock, will be turned into old iron and waste paper. But the report hints at a worse calamity than death. What can it be? Just listen:

"It is an admitted fact that a mind wholly absorbed in the consideration of one subject becomes weakened. If a fresh mind is brought to his aid, many things which now seem difficult will be found quite easy of solution."

This is it. Mr. Keely's labors may be too much for him. His friends are afraid he will go crazy, and this would be just as bad for his backers as his death. We don't pretend to be expert in such matters, and we never saw Mr. Keely or any of his family; but we hasten to give our opinion, judging from what observations we have made from time to time, about the possibility of Mr. Keely's becoming insane. The machine he originally proposed to construct was a very wonderful and unheard-of-machine, but that does not conclusively prove him a lunatic. He may have been a little jocular when he spoke of it, but not necessarily insane. Moreover, quite apart from the machine, Mr. Keely's conduct from the very beginning exhibits no trace of insanity. We have heard of inventors of so enthusiastic a turn and so engrossed in their inventions as to border on insanity; but it has always been shown by letting the control of a great invention gradually slip away from them, and seeing it profitable to some one else and themselves starving beggars. This does not seem to be the case with Mr. Keely's invention. He has enjoyed a regular salary from the company since it was started, and large sums of money have been placed in his hands, in return for which he has from time to time amused his supporters with curious mechanical entertainments. We cannot say that this shows any evidence of insanity; nor do we believe that he is altogether an idiot when he hesitates to give away the secret of his unfinished invention to anybody else. There are fools in the world, no doubt; there may be some in the Keely Motor Company; but Mr. Keely is not one of them.—*N. Y. Sun.*

Correspondence.

The Vermont Panther.

To the Editor of the Scientific American:

It seems to me not improper that some mention should be made in your columns of the remarkable specimen of puma (*Felis concolor*, L.) which was recently killed in the town of Barnard, Vermont.

We are not surprised at the stories related by our forefathers of hunting wolves, bears, panthers, and other large animals on spots long since thickly settled by man, nor at the strange experiences of the woodsman when his ax was first heard to ring in the primeval forest.

It is not an uncommon thing, indeed, now, for such animals as deer, catamounts, or bears to be shot or trapped in many towns on the northern border of New England; but when a full grown puma, one of the most savage of wild animals on our continent, is taken prowling about the outskirts of a town, in a State which is settled to such an extent as Vermont, we are enabled to realize the condition of the wilderness as it once was, and the nature of those animals with which it was denizened.

The circumstances of this remarkable hunt are as follows:

Some boys, who lived in Barnard, went out after partridges on Thanksgiving Day, November 24, 1881. They soon discovered the fresh tracks of some large animal, and on following a short distance crossed their own path. Being frightened at this circumstance, and also from catching a glimpse of the animal, they hastened back to the house of a neighbor, who soon accompanied them, armed with a shotgun, together with his son, who carried a rifle.

They presently sighted their game, which they chased to a thicket, where it was dislodged several times, but finally shot.

On dragging the animal out, what was at first thought to be a bear proved to be a female panther of the largest size, measuring 7⅛ feet from tip to tip, and weighing nearly 200 pounds.

It would seem strange at first that the animal was not more savage, that he did not charge his pursuers and kill them at once. This may, however, be partially accounted for from the fact, as afterward appeared, that it had made its supper on two sheep in Pomfret only the night before.

This is the second or third of the species killed in the State since the beginning of the century, and in all probability it will be the last.

The animal was in fine condition, being in its new fur, and showing no signs of having been previously trapped or wounded.

The upper right canine was truncated at about the middle, but this might have been done in a skirmish when the puma was young.

In general the color of the upper parts was tawny-yellow, with a darker wash of the same along the dorsal line, on the tip of the tail, the ears, and face. The whole animal presents in a striking and exaggerated manner the form and features of the ordinary domestic cat. The tail is straight and larger in diameter at the base, the neck short, the ears erect and pocketed. The dentition is precisely similar, the canines being conical, and rising an inch or more from the jaws.

The paws are seven inches wide when the fingers are spread, and conceal a very formidable set of claws.

This pather is supposed to have made the town and vicinity where it was taken its home for seven or eight years, and on several occasions has been seen or heard from.

One hundred and thirty sheep have probably fallen victims to its rapacious maw, as the town records would indicate.

The specimen was embalmed and exhibited in several towns in the State, and I am told a thousand dollars have been offered for its skin.

When mounted it will probably be placed in the State museum at Montpelier.

F. H. H.

Burlington, Vt., December 14, 1881.

A Question for Mr. Lawson to Answer.

To the Editor of the Scientific American:

Some fifteen years ago I sent to the SCIENTIFIC AMERICAN an account of what, according to the theory promulgated in No. 25, vol. xlv., should have produced a water explosion by its sudden release under steam pressure.

The facts in that case were: that a locomotive with two 8 x 12 cylinders, usually running with steam at 80 to 100 pounds pressure, was going through the woods on a roadway built for logging purposes, and ran under a leaning tree which had fallen since the last trip before made, and the smokestack, safety valve, etc., were knocked clean off. The water spouted forty feet in the air and the boiler was emptied in short order, but there was no explosion. Now, if the "water explosion" theory is correct, why was not there an explosion in this case?

E. H. ROOD.

sired, additional movable stairs, running parallel to and

Fig. 3 shows a side view of the tag partly in section, and Fig. 4 is a vertical transverse section.

group of pointed sickle-shaped black objects moving through the water had a curious appearance at a distance. I cannot

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) P. J. asks: How shall I construct a furnace so that in evaporating cane juice the pan will boil all the way alike? In the last stage, the fire being diminished, I have to stir from back to front, which darkens the sirup. Will corrugating the after end do, or a bath of whale oil, as this oil will maintain a heat of 600° without boiling? If this or any other liquid will do we then can get the fire surface. A You might use as an equalizing bath a concentrated solution of calcium chloride or zinc chloride. The corrugations proposed would not help the matter.

(2) J. A. L. asks: Is there any substitute for quicklime in the oxyhydrogen light which will be more permanent and less fragile? A. A clear, well-burned magnesian lime, prepared from dolomite, is better than ordinary lime. There is no better substitute that we know of.

(3) T. H. C. writes: 1. The SCIENTIFIC AMERICAN some time ago contained a reference to "Spence's" or "Spencer's" metal, a compound of sulphur with something else. Can you refer me to it, or describe it for me in your Notes and Queries? A. See answer to E. A. C., this page. 2. Do you know anything respecting the nature of tripolith, so called? A. No. You should address the manufacturers.

(4) S. S. Mfg. Co. ask: Will you please oblige us, through the medium of your valuable paper, with a recipe for making draughtsmen's sensitive paper for copying blue prints? It is extensively used by railroad companies for duplicating, and is a similar process to that used by photographers. A. Ammonia citrate of iron, 40 grains; distilled water, 1 oz.; dissolve and spread over the paper with a flat brush or glass rod. After drying (in the dark) expose to light under the negative. Develop by spreading over the paper the following solution: ferrocyanide of potassium, 1 drachm; water, 1 ounce. Rinse the developed blue print in plenty of soft water. To prevent fading, wash the print in a weak aqueous solution of ammonium carbonate (which will turn the color to a lavender hue), then wash in water and dry, when the blue color will be restored.

(5) J. D. B. asks: Is there a phosphorescent paint or wash that is of practical use in lighting, or that will assist in lighting a mill by night; and if so, how can it be made? A. For direction for preparing phosphorescent paint, see page 53, last volume. These paints are hardly of sufficient luminosity to aid much in illuminating apartments. 2. Also is there anything I can use on pine framework of a barn that will prevent horses from eating it? If so, what? A. Have you tried a thick lime wash?

(6) H. B. asks how to make a solution for silver plating—a solution that will deposit the silver in a polished state. A. See Stereotyping and Electrotyping, Electrometallurgy, in SUPPLEMENT, No. 310. 2. What is the best battery to use for the purpose? A. A bichromate cell is preferable. 3. Will a six-inch Grenet cell do? If not, why? A. If the work is quite small the Grenet cell may answer, but a larger cell would be better. 4. I have a bobbin, six inches in length, out of which I intend making an induction coil, but am in doubt as to what quantity of thick wire to use. A person told me that it was necessary to have an equal amount in weight of thick and fine wire. Is this true? A. No. 5. What number of fine wire is best to use for the purpose? A. No. 36. 6. On what does the power of the coil depend: on the number of feet of thick wire, number of feet of fine wire, or the thickness of the fine wire? A. On all, and upon an appropriate battery current. See *Induction Coils*, SUPPLEMENT, No. 160.

(7) E. A. C. asks: 1. Can you give me information in regard to the composition known as "Spence metal," of recent discovery and origin? Can it be procured in quantities. How can I get a specimen? A. See "Spence Metal," in SUPPLEMENT, No. 228. The metal is what may be called an alloy of sulphur and certain metallic sulphides—as iron sulphide. 2. Why is not aluminum produced cheaply for use in the mechanic arts? A. If the demand for aluminum were greater the cost of manufacturing it could be very considerably reduced. The cost is directly due to the high price of the metal sodium used in its reduction. 3. Is there any other metal of a very light specific gravity, say as light as aluminum or lighter, and with qualities, say, like lead and similar metals as to hardness and fusibility? A. We know of no such metal or alloy.

(8) J. L. writes: Would the developer, described in SCIENTIFIC AMERICAN of May 7, 1881, in answer to S. B. D., work without the addition of nitrate of silver? As the formula given by W. D. Richmond, SCIENTIFIC AMERICAN SUPPLEMENT, No. 226, shows that all of the $AgNO_3$ is converted into AgBr. I do not understand how development takes place. Please explain, showing reactions. A. The addition of silver was not recommended, and is not require.l. For the reaction of the iron developer consult any good work on the chemistry of photography.

(9) C. K. asks: Will you tell a number of us how thermometer tubes are graduated? A friend ordered a box of them. There were no two alike; all were of the same length. A. In the graduation of thermometers two points on the tube are first determined (after the instrument is filled and sealed properly), one to register the height of the column of mercury after fifteen minutes' exposure in pounded ice; the other the height of the column when the tube is exposed to steam at the atmospheric pressure (760 millimeters barometer). The space between these is then marked off into a certain number of equal degrees, according to the kind of scale to be used. Thus for the Fahrenheit scale the space would be divided into 180 parts or degrees, and the division continued downward beyond the lower mark, 32°, thus making 212 divisions in all—the lowest being zero on this scale, and the highest 212°, while the 32d division from the bottom registers the freezing point of water. In the Celsius or centigrade scale the space between the freezing and boiling points is divided into 100 parts or degrees, while in the Reaumur scale the same space is divided into 80°—the zero mark in these scales corresponding to the freezing point (32°) on the Fahrenheit scale.

(10) W. M. M. asks: Is there any difference of water level at the Isthmus of Panama, between the Pacific Ocean and the Caribbean Sea? A. There is no absolute level; but, since the tides are much greater on the eastern side of the Isthmus, the water level at high tide on that side is several feet above high water level on the western side.

(11) F. H. G. asks: How can I make a solution for copper plating? A. See Electrometallurgy and Copper Deposits, in SUPPLEMENT, No. 310. 2, How to make the best razor strop paste? A. Levigated tin oxide (putty powder), 1 ounce; powdered oxalic acid, ¼ ounce; powdered gum, 20 grains; make into a stiff paste with water, and evenly and thinly spread it over the strop. Or, emery flour (finest), 2 parts; spermaceti ointment, 1 part; mix together and rub it over the strop. Or, jeweler's rouge, blacklead, and suet, equal parts.

(12) E. M. H. asks: 1. What can I use for packing the plunger of a lead pump for oil of vitriol? Rubber will not stand. A. Try asbestos packing. See our advertising columns for addresses of dealers. 2. Theoretically a small cell of battery should give the same electromotive force as a large one. I find a vast difference in favor of the large cell, in work actually performed on a motor. How is this? A. The internal resistance of a large cell is less than that of a small cell of the same type, and, as ordinarily constructed, the relative volume of liquid to active metal surface is greater, consequently the conditions of maximum current are longer maintained in the larger than in the smaller cell.

(13) W. T., Jr., asks: Has there been any means invented to successfully prevent the reuse of canceled postage stamps? A. No.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

S. B.—It consists chiefly of copper and iron sulphide and carbonates, probably carrying silver. If the sample is representative of the body of ore, the property is likely to prove a valuable one.—R. J. C.—It is a piece of burnt iron or steel—of artificial origin.—M. A.—It is impure phosphocalcite—a native phosphate of copper.

COMMUNICATIONS RECEIVED.

On German Hygienic and Life-saving Exhibition.

On a Rainbow. By J. B. D.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

December 6, 1881.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Medicines for human use, D. B. S. Galbraith 8,899
Oils, illuminating, Wadsworth, Martinez & Longman 8,910
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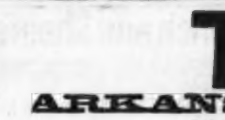

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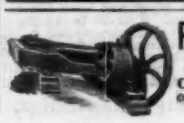

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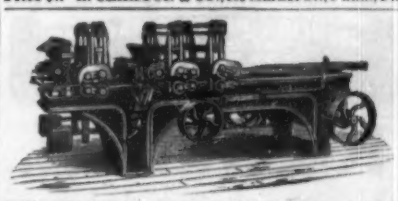

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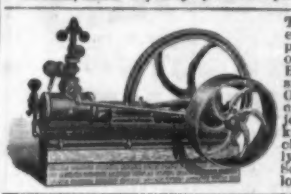

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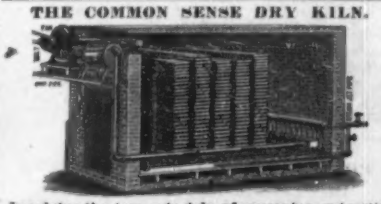

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